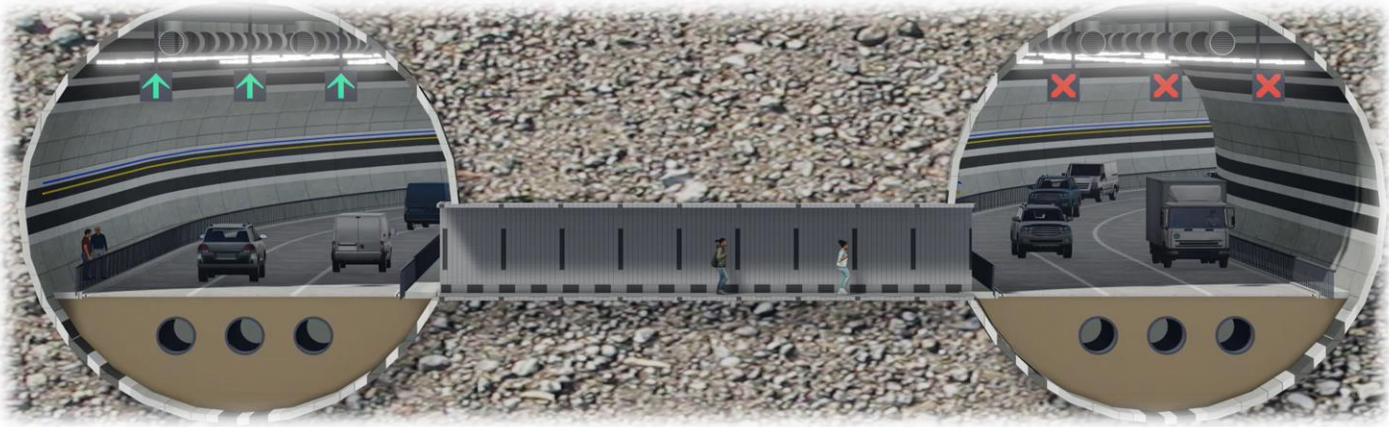
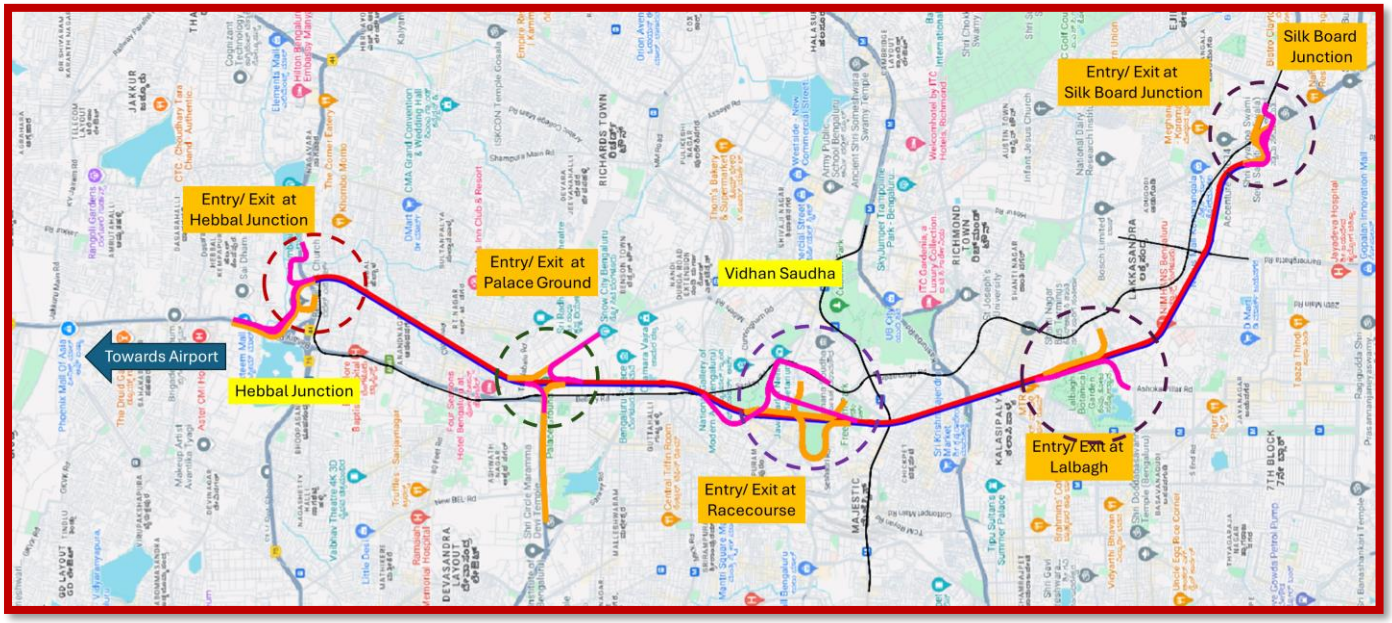
GOVERNMENT OF KARNATAKA



CONSULTANCY SERVICES FOR PREPARATION OF DPR FOR THE WORK OF CONSTRUCTION OF UNDERGROUND VEHICULAR TUNNEL FROM HEBBAL ESTEEM MALL JUNCTION TO SILK BOARD KSRP JUNCTION



DRAFT DETAILED PROJECT REPORT

GEOTPHYSICAL SURVEY REPORT

October 2024

Rodic
ENGINEERING. PASSION

RODIC CONSULTANTS PVT. LTD

BRUHAT BENGALURU MAHANAGARA PALIKE

GEOPHYSICAL SURVEY REPORT

Rev-0

October 26, 2024

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Table of Contents

1. INTRODUCTION 5
1.1. CURRENT PROJECT 5
1.2. Aim 5
1.3. Scope of Work 5
2. GEOPHYSICAL INVESTIGATION 6
3. LOCATION AND ACCESSIBILITY OF PROPOSED ALIGNMENT 8
4. GEOLOGY OF THE PROJECT AREA 9
4.1. General Geology of the Project area 9
4.2. Seismicity 11
5. SEISMIC REFRACTION SURVEY 12
5.1. Basic Principle of Seismic Refraction method 12
5.2. Equipments used for Seismic Refraction Survey 12
5.2.1. Equipment and Source Details: 12
5.2.2. Limitation of Equipment: 13
5.3. Field Survey Method, Instrumentation and Measurement Procedures 13
5.4. Data Processing & Interpretation 14
5.5. Estimation of Rock Mass Quality Q from P- wave velocity (Vp) 16
5.6. Limitations of Refraction Method 16
6. MULTICHANNEL SPECTRAL ANALYSIS OF SURFACE WAVE (MASW): 17
6.1. Basic Principle of MASW Survey 17
6.2. Generation of 1-D And 2-D S-Wave Velocity Images 18
6.3. Equipment and Source Details 19
6.4. Data Processing: 19
6.5. Limitations of MASW Survey: 19
7. DISCUSSION OF RESULTS 20
7.1. Details of Geophysical Survey Profiles and Data Acquisition 20
7.2. Interpretation of Seismic refraction Sections AND MASW SECTIONS 20
7.2.1. Hebbal (SRT-1): 20
7.2.2. In Prestige Group: (SRT-1A) 21
7.2.3. In Prestige Group (SRT-1B) 21
7.2.4. Near Bethal A.G. Church (SRT-1C) 22
7.2.5. On Jayamahal Main Road (SRT-2) 22
7.2.6. In Golf Course (SRT-3) 23
7.2.7. In Race Course (SRT-4) 23
7.2.8. In Race Course (SRT-5) 24
7.2.9. In Bengaluru University (SRT-6) 24
7.2.10. Lal Bagh (SRT-7) 25
7.2.11. Lal Bagh (SRT-7A) 25

7.2.12. NIMHANS (SRT-9) 26
7.2.13. In Christ University (SRT-10) 26
7.2.14. ST. JOHNS (SRT-11A) 27
7.2.15. ST. JOHNS. (SRT-11B) 27
7.2.16. ST. JOHNS (SRT-12A) 28
7.2.17. ST. JOHNS (SRT-12B) 28
7.2.18. ST. JOHNS (SRT-13): 29
7.2.19. MASW-2: 30
7.2.20. MASE-3: 30
7.2.21. MASW-4: 31
7.2.22. MASW-5: 31
7.2.23. MASW-6: 32
7.2.24. MASW-7: 32
7.2.25. MASW-8: 33
7.2.26. MASW-9: 33
7.2.27. MASW-9A: 34
7.2.28. MASW-10: 34
7.2.29. MASW-11: 35
7.2.30. MASW-12: 35
7.2.31. MASW-13: 36
7.2.32. MASW-14: 36
7.2.33. MASW-15: 37
8. CONCLUSIONS AND RECOMENDATIONS 38
ANNEXURE - 1 - LOCATION PLAN 39
ANNEXURE - 2 - INTERPRETED SECTIONS OF SEISMIC REFRACTION AND MASW SURVEY 69
ANNEXURE - 3 - SITE PHOTOGRAPTHS 103

List of Tables

Table 1: End coordinates of Seismic Refraction Profiles 6
Table 2: End Coordinates of MASW Profiles 6
Table 3: List of typical P-wave velocity (Vp) for common soil and rock types (Press, 1966).....15
Table 4: Empirical relationship between Seismic Velocity Vp and Q-value 16
Table 5: Classification of Rock based on Q-value 16

List of Figures

Figure 1 : Project Location 8
Figure 2 : Geological Map of the Project area (Source: GSI – open source Bhukosh) 10
Figure 3 : Principle of Seismic Refraction Survey 12
Figure 4 : Geometry of seismic spread having 24 geophones and 7 shots (Schematic) 14
Figure 5 : Typical ranges of Seismic Wave (P-Wave) velocity for little weathered and moderately fractured rocks (Sjogren, 1984) 14
Figure 6 : Typical ranges of Seismic Wave (P-Wave) velocity for common rock types (Griffiths and King, 1987) 15
Figure 7 : Dispersion of Rayleigh wave depicting relationship between phase velocity (V) & wavelength (λ) for (a) vertically homogeneous medium, and (b) vertically heterogeneous medium. 17
Figure 8 : Procedure for generating 1-D MASW Profile 18
Figure 9 : Procedure for developing 2-D MASW Image 18
Figure 10 : Seismic Section of SRT-1. 20
Figure 11 : Seismic Section of SRT-1A. 21
Figure 12 : Seismic Section of SRT-1B. 21
Figure 13 : Seismic Section of SRT-1C. 22
Figure 14 : Seismic Section of SRT-2. 22
Figure 15 : Seismic Section of SRT-4. 23
Figure 16 : Seismic Section of SRT-6. 24
Figure 17 : Seismic Section of SRT-7A. 25
Figure 18 : Seismic Section of SRT-9 26
Figure 19 : Seismic Section of SRT-10. 27
Figure 20 : Seismic Section of SRT-11A 27
Figure 21 : Seismic Section of SRT-11B. 28
Figure 22 : Seismic Section of SRT-12A. 28
Figure 23 : Seismic Section of SRT-12B 29
Figure 24 : Shear Wave Velocity Section of MASW-2 30
Figure 25 : Shear Wave Velocity Section of MASW-3 30
Figure 26 : Shear Wave Velocity Section of MASW-4 31
Figure 27 : Shear Wave Velocity Section of MASW-5 31
Figure 28 : Shear Wave Velocity Section of MASW-6 32
Figure 29 : Shear Wave Velocity Section of MASW-7 32
Figure 30 : Shear Wave Velocity Section of MASW-8 33
Figure 31 : Shear Wave Velocity Section of MASW-9 33
Figure 32 : Shear Wave Velocity Section of MASW-9A. 34
Figure 33 : Shear Wave Velocity Section of MASW-13 36
Figure 34 : Shear Wave Velocity Section of MASW-14 36
Figure 35 : Shear Wave Velocity Section of MASW-15 37

1. INTRODUCTION

Bruhat Bengaluru Mahanagara Palike (BBMP) intends to Construct a Underground Vehicular Tunnel for the North – South Corridor starting from Hebbal Esteem Mall junction to Silk Board KSRP Junction. In pursuance of the above, Rodic Consultants Pvt Ltd., New Delhi has been appointed as consultants to carry out Consultancy Services for Preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbel Esteem Mall junction to Silk Board KSRP junction.

1.1. CURRENT PROJECT

The entire project is located in Bengaluru city. The North – South Corridor starting from Hebbal Esteem Mall junction to Silk Board KSRP Junction is going to develop as Underground Vehicular tunnel having 04 connecting stretches with Entry and Exit are as below:

- Esteem Mall-Hebbal-Mekri circle-Palace Ground
- Palace Ground- Golf Course-Race Course-Palace Road Jn
- Racecourse/Chalyuka circle-Lalbagh BG
- Lalbagh Botanical Garden- Silk Board KSRP Jn

This Geophysical survey hasbeen conducted to add additional subsurface information for geological mapping where rock exposures are not visible.

1.2. Aim

The aim of carrying out geophysical investigation is to assess the subsurface condition at the tunnel portals, bridges, station and other important locations of the proposed alignment. Seismic Refraction and Multichannel Analysis of Surface Wave (MASW) techniques have been used to gain information about subsurface layering and rock properties along the proposed tunnels. These techniques together have been used to map stratigraphic units, geological structure and fractures along the proposed alignment.

1.3. Scope of Work

As per the scope of the present study geophysical investigations by using Seismic Refraction (SR), Multichannel Analysis of Surface Waves (MASW) are to be carried out along the proposed tunnels at some of the available locations along the proposed tunnel alignment between from Hebbal Esteem Mall Junction to Silk Board KSRP Junction, Bangalore, Karnataka).

Geophysical survey in the entire alignment corridor has been conducted between September 12 2024 to September 24 2024, covering 2390 m Seismic Refraction, and 1071 MASW.

Present report is being submitted for the geophysical investigations carried out between Hebbal Esteem Mall Junction to Silk Board KSRP Junction, Bangalore, Karnataka).

2. GEOPHYSICAL INVESTIGATION

There are various methods to carry out Geophysical investigation for the proposed area. In this project, the locations proposed to be investigated have been explored by Seismic Refraction survey and MASW. This has helped in assessing the geological strata beneath.

Present report includes the comprehensive field test data and interpretations for Seismic Refraction (SR) and MASW survey. Keeping high ambient noisy conditions in the study areas seismic refraction and MASW survey was conducted Seismic refraction survey has been conducted on those locations where noise was relatively low and MASW survey was conducted where noise was substantially high. Some of the proposed locations for geophysical investigation could not be surveyed on proposed locations due to road and other cultural activities and some shifting were made. General location plan of the proposed study area is given in Figure-1.

All the distances were measured along the ground surface. All the coordinates are in UTM system. Objective of geophysical investigation conducted in the project area has been as below:

- To map thickness of overburden.
- To map depth and weathering profile of bed rock.
- To access the characteristics of sub surface in terms of seismic velocity.
- Identify possible anomalous zone in bedrock (if any).

Table 1: End coordinates of Seismic Refraction Profiles

Location	SRT Profile No.	Start Point			End Point			Length, m*
		Easting	Northing	Elevation, m	Easting	Northing	Elevation, m	
Near Rly Track Hebbal	SRT-1	E-781859	N-1443184		E-781742	N-1443167		115
Prestige Group	SRT-1A	E-781748	N-1443435		E-781737	N-1443320		115
Prestige Group	SRT-1B	E-781841	N-1443527		E-781953	N-1443553		115
Near Bethel A.G. Church	SRT-1C	E-781492	N-1443485		E-781427	N-1443388		115
On Jayamahal main road	SRT-2	E-780927	N-1439791		E-780861	N-1439886		115
In Golf Course	SRT-3	E-780084	N-1437422		E-780197	N-1437256		200
In Race Course	SRT-4	E-780090	N-1436704		E-780071	N-1436471		235
In Race Course	SRT-5	E-779628	N-1436707		E-779604	N-1436478		230
Bangaluru University	SRT-6	E-780016	N-1435891		E-779945	N-1435802		115
In Lala Bagh	SRT-7	E-780772	N-1433141		E-780808	N-1433031		115
In Lal Bagh	SRT-7A	E-780973	N-1432707		E-780859	N-1432722		115
NIMHANS area	SRT-9	E-781398	N-1431824		E-781509	N-1431863		115
In Christ University	SRT-10	E-782775	N-1431247		E-782721	N-1431146		115
St. Johns	SRT-11A	E-783417	N-1430840		E-783424	N-1430722		115
St. Johns	SRT-11B	E-783501	N-1430676		E-783606	N-1430723		115
St. Johns	SRT-12A	E-783860	N-1430688		E-783925	N-1430593		115
St. Johns	SRT-12B	E-783934	N-1430577		E784045	N-1430610		115
St. Johans	SRT-13	E-784019	N-1430500		E-784120	N-1430444		115

* All the lengths have been measured along ground surface.

Table 2: End Coordinates of MASW Profiles

Location	MASW Profile No.	Start Point			End Point			Length, m*
		Easting	Northing	Elevation, m	Easting	Northing	Elevation, m	
	MASW-2	E-781806	N-1442978		E-781875	N-1442987		69
	MASW-3	E-781710	N-1442598		E-781777	N-1442583		69
	MASW-4	E-781429	N-1442348		E-781529	N-1442313		105

Location	MASW Profile No.	Start Point			End Point			Length, m*
		Easting	Northing	Elevation, m	Easting	Northing	Elevation, m	
	MASW-5	E-781206	N-1441835		E-781137	N-1441842		69
	MASW-6	E-781082	N-1441533		E-781013	N-1441533		69
	MASW-7	E-780879	N-1441281		E-780872	N-1441212		69
	MASW-8	E-780727	N-1441006		E-780698	N-1440943		69
	MASW-9	E-779172	N-1440172		E-779103	N-1440167		69
	MASW-9A	E-779480	N-1440187		E-779411	N-1440187		69
	MASW-10	E-780013	N-1435517		E-779980	N-1435457		69
	MASW-11	E-780167	N-1435096		E-780141	N-1435031		69
	MASW-12	E-780345	N-1434468		E-780351	N-1434400		69
	MASW-13	E-780573	N-1433822		E-780558	N-1433754		69
	MASW-14	E-783216	N-1431059		E-783281	N-1431035		69
	MASW-15	E-780851	N-1439897		E-780811	N-1439955		69

* All the lengths have been measured along ground surface.

3. LOCATION AND ACCESSIBILITY OF PROPOSED ALIGNMENT

Most of the proposed locations given for geophysical survey are either in open areas lying in the premises of different institutes or the government offices. Most of the locations were accessible but needed permissions from the concerned authorities. Some of the proposed locations were lying along the roads where vehicular movement was almost 24 hours due to which substantial noise was present during data collection.

The brief description of project area geology has been given in the subsequent paragraph.

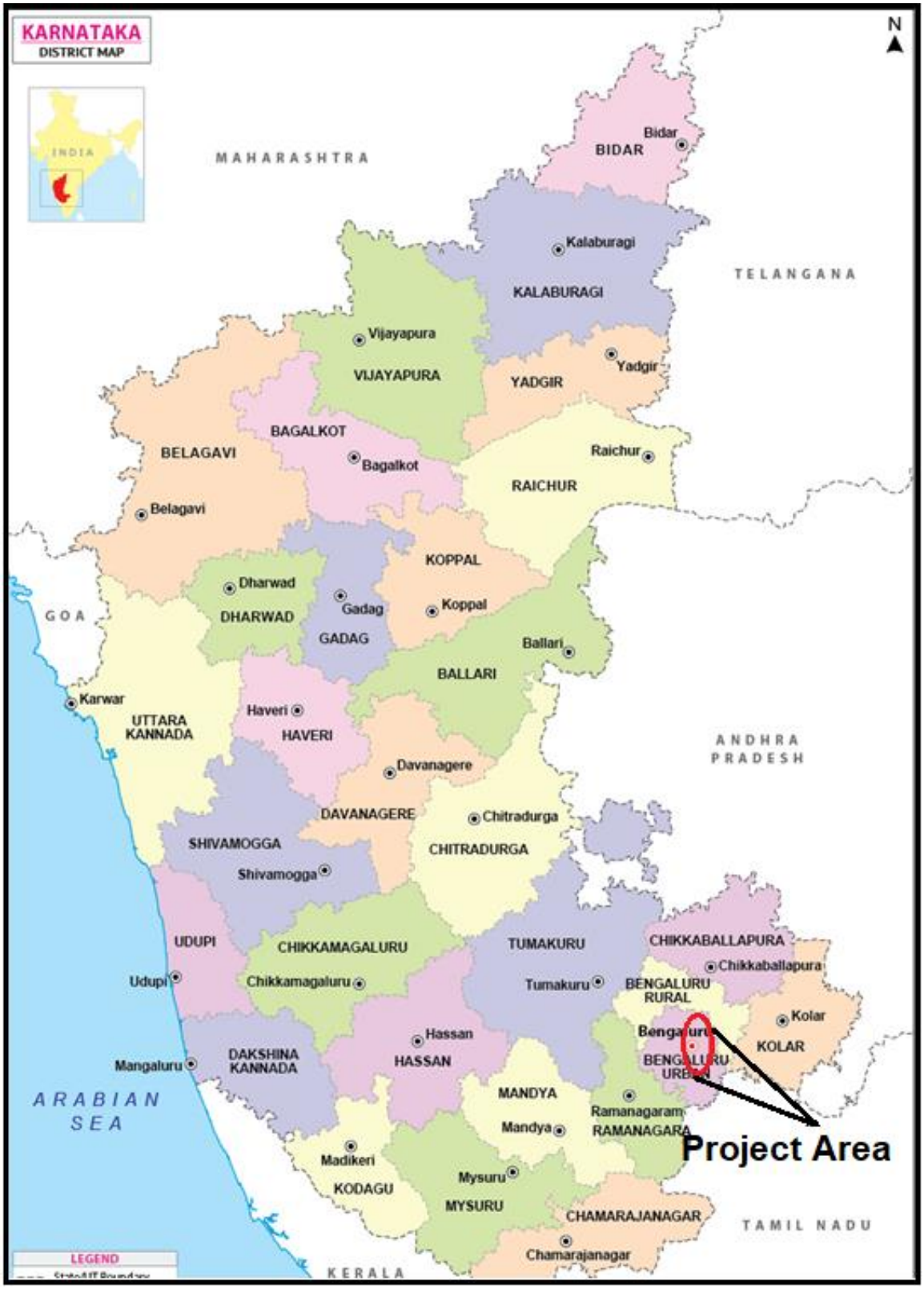


Figure 1 : Project Location

4. GEOLOGY OF THE PROJECT AREA

4.1. General Geology of the Project area

The project area occurs at Eastern part of the Dharwar Craton. As its base, the Basement Gneiss, a polyphase migmatite (Tonalite- trondhjemite-granodiorite-TTG) originated over a period of 3400Ma. Over it the volcano- sedimentary Sargur Supracrustal (green stone belt) rocks were deposited and metamorphosed, and what was subsequently intruded by another phase of TTG about 3000Ma which is referred to as the Peninsular Granite Suite-1 groups of rocks.

Subsequent tectonic deformations created linear belts of basins for the deposition of the younger volcano-sedimentary deposits and their metamorphism, also referred to as the rocks of the younger Dharwar/ Kolar type Super Group around 2700Ma. These belts comprised of rocks which metamorphosed included grits/arenites, pelites, Bimodal mafic- felsic volcanics, pyro clasts, agglomerates, layers of BIF, local komatiites, Quartzites (locally cross bedded), manganese marble, stromatolitic carbonate, calc- silicate, cordierite bearing pelites, amphibolite etc. This was followed by the next phase of granitic- granodiorite intrusion rich in potassium and mafic constituents about 2350-2600My. The resultant rocks occurring to the East of the Closepet Granite is referred to as Peninsular Gneiss II (Bangalore Supersuite)/ Dharwar Batholith.

The project alignment is approximately N-S oriented between Esteem Mall Junction to Silk Board Junction. The bed rock Geological Stratification between the locations is shown in Figure 5. The project alignment takes off from close North of the Hebbal Lake near Esteem Mall. Proceeding southwards, the alignment passes through a topographic depression, thorough which a nalla/drain flows connecting the Hebbal and Nagavara Lakes. The area is suspected have a significant fill material and deeper weathered zone. The bedrock in the area is identified with Grey Granite equivalent to Closepet Granite Formation of Paleo-Proterozoic age.

Further south, near to the Palace Ground, where the proposed link Tunnels are proposed to connect the main tunnel and having the Sankey Tank towards the west of the Main Tunnel Alignment and the Palace lake over the alignment, a substantial outcropping and thickening of laterite rocks is observed.

Advancing further south, immediately after the Racecourse, the next set of intersections are also set in the same Grey Granite as bedrock. Further south, in the Lal Bagh area, the Bed rock is in a transition zone. The alignment is set to cross a prominent lineament, which the Lal bagh lake in the vicinity and the Grey Granite bedrock in contact with Hornblende Granite. The alignment curves eastward and is set to negotiate through the Hornblende Granite for about 1.5-2Km before crossing into the Hornblede-Biotie Gneiss of Precambrian Geiessic Complex-II.

General geology of the project area is given in Figure-2.

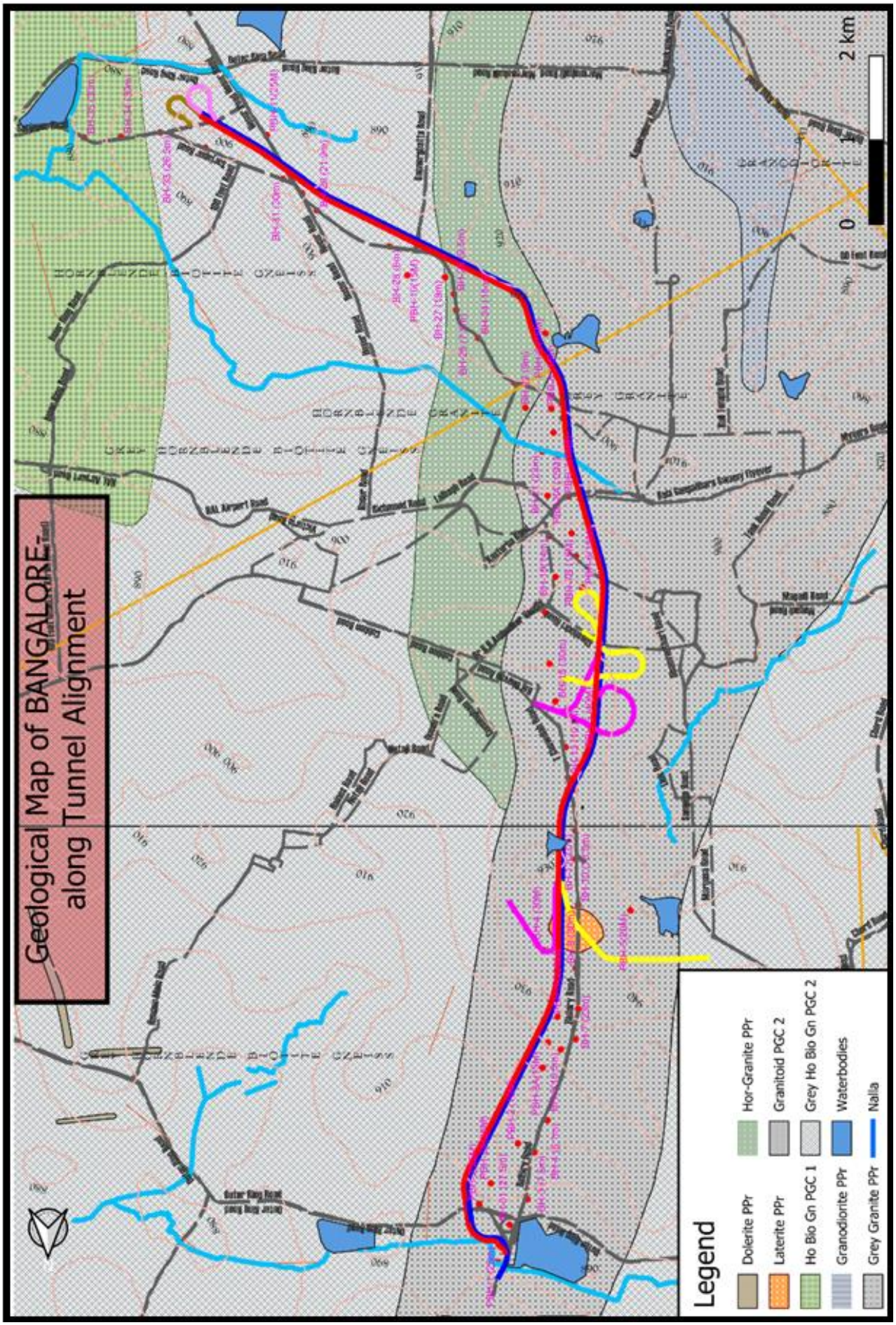


Figure 2 : Geological Map of the Project area (Source: GSI – open source Bhukosh)

4.2. Seismicity

The project area in the Bangalore city is part of the least seismically active and low risk , Seismic Zone II, with a Zone Factor Z of 0.10 as per IS1893, (Part 1) 2002. The final report on Development of Probabilistic Seismic Hazard Map of India (PSHMI) by National Disaster Authority (NDMA), places Bangalore City under Zone 29 called Southern Craton, which has a maximum potential Earthquake of Magnitude up to 6.8Mw scale. According to PHSMI, Bangalore has a relative Seismic Hazard at 0.02,0.04,0.05 and 0.06 PGA(g) over 500,2500,5000 and 10000 years, time period

The details of geophysical investigation carried by conducting Seismic Refraction Survey (SR) and Multiple Spectral analysis of Surface Wave (MASW) Survey, along the entire proposed alignment, has been described in the subsequent chapters of this report.

5. SEISMIC REFRACTION SURVEY

5.1. Basic Principle of Seismic Refraction method

Seismic refraction survey is one of the important geophysical exploration techniques being widely used for engineering projects. This method is based on measuring the arrival times of seismic waves refracted by the interfaces between layers of ground characterized by different propagation speeds. The energy source represents impact of sledge hammer on the surface. The energy radiated from the "shot point" travels directly in the uppermost layer (direct arrivals), deep down and laterally along layers at a higher speed (refracted arrivals), then returns to the surface. At surface, it is measured through the spreads of geophones of10 Hz frequency. In the vicinity of the source point the waves travelling along ground surface are first to arrive. At a certain distance from the source point, the waves following the longer but faster paths in the underlying layers overtake the surface waves. The distances from the source to the points where the refracted waves are recorded as first arrivals are a function of the velocities in the strata and their depths.

Seismic refraction work is generally carried out with source points and detectors placed in a straight profile. The detectors used (called geophones) which are sensitive to ground vibrations, are used for taking measurements on land. The impact of the ground motion on the detectors is transformed into an electric current and the signal is transmitted by cables to a recording unit called “seismograph”, which comprises an amplifying unit and a recorder. Recorded signals are saved on system’s hard disc for later processing and interpretation. The basic operating principle for refraction surveys is shown in Figure-3.

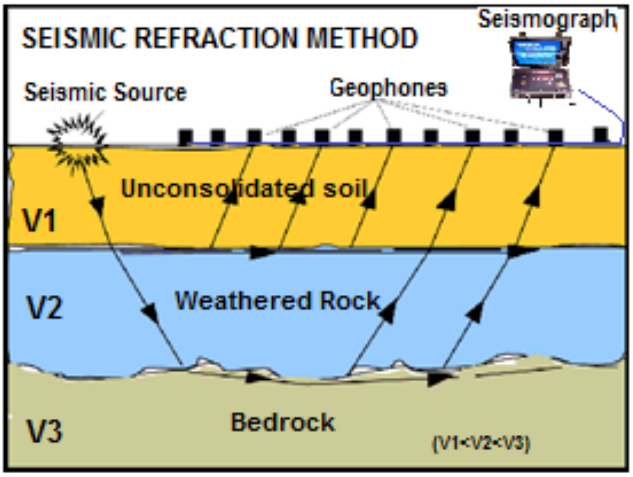


Figure 3 : Principle of Seismic Refraction Survey

By generating seismic waves at source point and observing the time of arrival of these waves at various detector locations on ground surface, velocity and depth of different subsurface layers has been calculated.

5.2. Equipments used for Seismic Refraction Survey

The details of equipment and its accessories are given below.

5.2.1. Equipment and Source Details:

The equipment used in the seismic refraction survey is a 24-Channel digital seismograph GEA 24 (PASI Srl, Italy). This is a high-resolution digital seismograph with facility of data stacking, frequency filtering and various other digital signal processing capabilities available for optional selection of data acquisition parameters. Vertical geophones of 10 Hz frequency were used as sensors. The geophones have been hooked on to the acquisition unit through specially provided multiple take-out cables. A 8 kg weight sledge-hammer has been used as seismic source. The field set-up of the present seismic refraction survey are as follows:

- Data acquisition unit: GEA 24 (PASI Srl , Italy)
- No. of channels used: 24

- Source type used: Sledge hammer (8Kg)
- Trigger mode: Trigger Switch
- Channel spacing: 5 m
- Sampling interval: 0.125 millisecond (ms)
- No. of stacks: 5-15 (cumulative)
- Recording format: SEG 2
- Display type: Monochrome in wiggle or other formats
- Data processing: SeisImager 2D (Computer controlled software).

5.2.2. Limitation of Equipment:

The seismograph used for the seismic refraction survey in the project area has few limitations as given below:

- The seismograph cannot be used in heavy rain and thunderstorm.
- The seismograph cannot be used under High Tension (HT) electrical lines passing overhead and parallel to the survey profile.
- The seismograph cannot be used in heavy noisy conditions like a running plant and machinery near the survey line.

Keeping these limitations in view, Seismic Refraction survey has been carried out in field in appropriate climatic condition and locations.

5.3. Field Survey Method, Instrumentation and Measurement Procedures

For the entire area, seismic refraction survey has been conducted by placing 24 numbers of geophones at regular interval of 5 m along a straight profile. This array of geophone in a straight line is known as geophone spread or seismic spread. The geophones and shot locations were marked on the ground along the proposed alignment. Seven shot points (S1 to S7) were commonly used for each spread (Fig.4). This included two far shots on either side of the spread to provide the true seismic velocity of the rock, two end shots to obtain reciprocal times, and three mid shots within the profile to obtain lateral velocity variations. Sometimes additional mid shots are taken depending on the requirement for adequacy of data. Basic geometry of seismic spread having 24 geophones (1 to 24) and seven shot (S1 to S7) points is shown in Figure-4.

Geophone spacing and the length of spread depends upon the required depth of investigation and the dimensions of any subsurface features that are to be mapped. The length of spread kept in this project is approximately four to five times the depth of investigation required. Survey data for all the source and geophone locations has been provided by the client to measure actual horizontal distances and levels.

As a standard practice of measurement procedure, locations of geophones and shot points have been stacked on the ground and geophones were planted on the stacked locations along seismic profiles. All the geophones have been connected with recording unit through take out cables. Sledge hammer has been used as seismic source placed on pre-marked shot locations along the seismic profile. The far offset shots have been recorded at a distance of 30m to 60m from either side of the spread depending on site conditions. The seismic record for each shot has been verified for quality corresponding to each geophone. In case of poor quality of signal, the shot has been repeated.

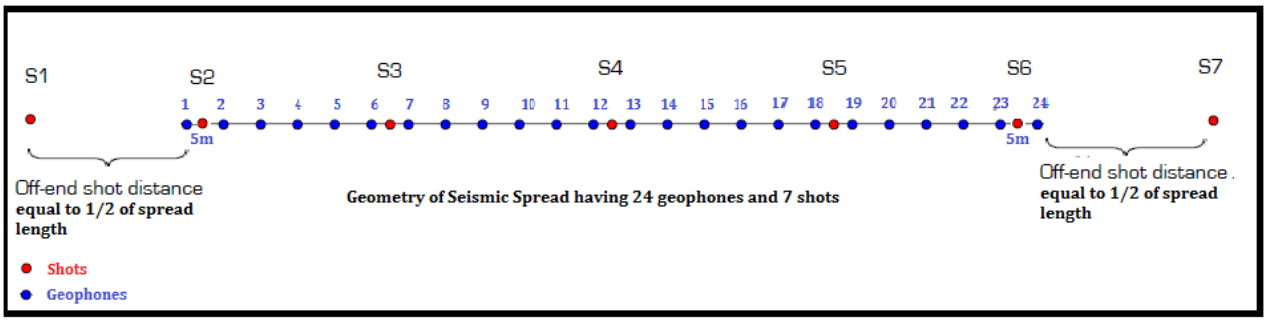

S1
S2
S3
S4
S5
S6
S7
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
5m
5m
Off-end shot distance equal to 1/2 of spread length
Geometry of Seismic Spread having 24 geophones and 7 shots
Off-end shot distance equal to 1/2 of spread length
Shots
Geophones

Figure 4 : Geometry of seismic spread having 24 geophones and 7 shots (Schematic)

5.4. Data Processing & Interpretation

Processing of seismic data has been carried out by SeisImager software, which has various processing and interpretation modules e.g. PickWin, PlotRefa etc. Picking of first arrival has been done precisely through PickWin. Reciprocity of travel time curves has been checked with respect to 3 mili-second of travel time. If the reciprocity criterion of the travel time curve is not met, then re-picking of traces has been carried out.

Initial velocity and depth model have been calculated by using intercept-time method to establish initial model. The initial model established has been further refined by inversion technique (tomographic inversion) with the help of PLOTREFA software. In the inversion techniques used by the processing software, an initial model, calculated by time-intercept method, has been given for which the computer works out a theoretical model in the form of theoretical travel time curves and compare it with the initial field model which is based on measured travel time curves. Then it takes the difference between the computed and the field model and assigns it to the new model for reducing the difference or the error. It again computes a new theoretical model, compare with the field model, and sets another new model to reduce the difference (error). This is iterative process and it goes on till the error has been minimized and finally displays the model in terms of seismic sections. The seismic sections thus obtained are interpreted in terms of geological units.

The seismic velocities are characteristics of the nature and quality of the bedrock; Seismic wave velocity in soil is dependent on the soil type and its condition. In rock it is dependent upon the degree of weathering, jointing, fracturing etc. Seismic sections give the information about the subsurface stratigraphy in terms of their seismic velocities, which are directly related to the quality and the strength of the medium.

Comprehensive knowledge of the seismic velocities in different medium is the basis of interpretation of seismic survey data. The velocity variation thus obtained is correlated with local geology by using typical ranges of seismic velocities in different geologic medium under dry and wet conditions. Range of seismic velocity in different geological conditions has been shown in Figure-5 and has also been given in Table

.

Figure 5 : Typical ranges of Seismic Wave (P-Wave) velocity for little weathered and moderately fractured rocks (Sjogren, 1984)

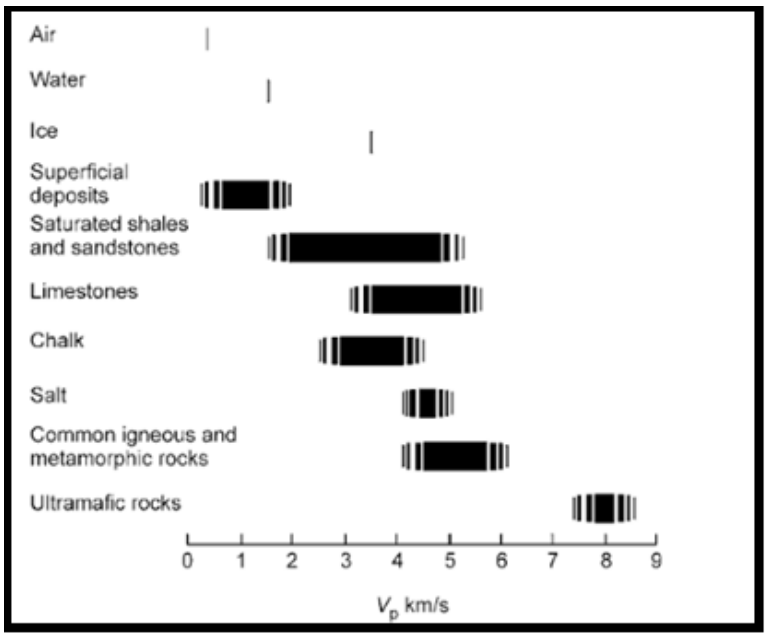


Figure 6 : Typical ranges of Seismic Wave (P-Wave) velocity for common rock types (Griffiths and King, 1987)

Table 3: List of typical P-wave velocity (Vp) for common soil and rock types (Press, 1966)

Material	Vp (m/s)
Alluvium	500-2100
Clay	1100-2500
Sand	200-2000
Glacial Till	400-1700
Sandstone	1400-4500
Shale and Slate	2300-4700
Limestone	
Soft	1700-4200
Hard	2800-6400
Crystalline	5700-6400
Dolomite	3500-6900
Granite, Granodiorite	4600-6000
Diabase	5800-6000
Gabbro	6400-6700
Basalt	5400-6400
Schist	4200-4900
Gneiss	3500-7500
Water	1450
Air	335

For the interpretation of subsurface strata, velocities measured through seismic refraction survey, available geological data and the information of subsurface velocities of different geological materials under unsaturated and saturated conditions as shown in Figs.5 and 6 and Tables 3 have been used.

The seismic sections giving detailed information about the subsurface stratigraphy in terms of seismic velocity distribution has been prepared for each investigation location and the velocity distribution has been correlated with the density of the medium. Reduced seismic velocities indicated weathered, sheared, faulted or fractured rock.

Seismic velocities in the rock mass can also be correlated with other engineering properties like rock mass quality by specific empirical relationship.

5.5. Estimation of Rock Mass Quality Q from P- wave velocity (Vp)

The empirical correlation between seismic P- wave velocity (Vp) and rock mass quality Q proposed by Barton (2002) for a rough estimation of Q ahead of the tunnel face using P – wave velocity is:

$$Q = 10(Vp - 3.5)$$

Where, Vp is seismic P – wave velocity in km/sec.

In order to have a preliminary assessment of the tunnelling media, a reference is made to the expected Q-value of the rock mass is given in Table-4.

Table 4: Empirical relationship between Seismic Velocity Vp and Q-value

Vp (m/sec)	1500	2500	3500	4500	5500	6500
Q-Value	0.01	0.1	1.0	10.0	100.0	1000.0

On the basis the Q value, the rock masses are classified into nine categories given in Table 5.

Table 5: Classification of Rock based on Q-value

Q-value	**Rock Mass Category**
0.001 – 0.01	Exceptionally Poor
0.01 – 0.1	Extremely Poor
0.1 – 1.0	Very Poor
1.0 – 4.0	Poor
4.0 -10.0	Fair
4.0 – 40.0	Good
40.0 - 100	Very Good
100 - 400	Extremely Good
400 - 1000	Exceptionally Good

5.6. Limitations of Refraction Method

Seismic refraction method has following limitations:

- The hilly terrain where surface topography is undulating and does not follow a constant slopping trend and the degree of slopes exceeds more than 35 degrees, the estimated depth may have error.
- At sites with steeply dipping or highly irregular bedrock surfaces, out of plane refractions may severely complicate the model as refractions from the side of profile can get registered rather than from beneath the profile.
- In case of hidden zone (low velocity layer) or blind zone (thin layer) the depth of the subsurface interfaces would either be overestimated or underestimated. In such cases depth of subsurface interfaces should be correlated with borehole data and other information available from geological mapping.
- The errors in subsurface relief at source and receiver locations might restrict the accuracy of the depths to various horizons within 10%, but with digital data recording and computerizes data processing combined with errors in surface relief within 0.1 meter can bring down the accuracy within 5%.

However, these geophysical informations have to be correlated and calibrated with the drilling data in the detail design stage of the project.

6. MULTICHANNEL SPECTRAL ANALYSIS OF SURFACE WAVE (MASW):

6.1. Basic Principle of MASW Survey

The MASW is a surface wave method that utilizes the phenomenon of geometric dispersion of Rayleigh Wave to determine the shear wave (S-wave) velocity distribution underground; the propagation velocity of Rayleigh Wave is dependent on wave length as well as material properties. The prime efficacy of this technique lies in providing detailed 1-D & 2-D subsurface images, without being affected by velocity reversal, hidden layer problem, etc. The field setup for MASW technique is relatively simple and does not require arrangement of drill hole. MASW has the capacity to resolve gradual variations in velocity distribution with higher order of precision.

Multichannel Analysis of Surface Waves (MASW) is a non-destructive surface wave technique based fundamentally on the dispersion of Rayleigh wave, analysis of which helps in determination of the vertical distribution of the S-wave velocity underground The S-wave velocity is a function of the elastic properties of the subsurface medium and is directly related to the hardness and stiffness of the materials.

The Rayleigh Wave dispersion characteristic is illustrated in Figure 10. Dispersion is the process by which, the mechanical properties of the subsurface layers with different frequencies/wavelength have different phase velocity. In a vertically homogeneous medium, as the mechanical property remains unchanged, the wavelengths vary with depth while the phase velocity remains constant. Whereas, in case of vertical heterogeneity, the wavelength varies depth-wise and the phase velocity is different for each subsurface stratum that has specific mechanical characteristics.

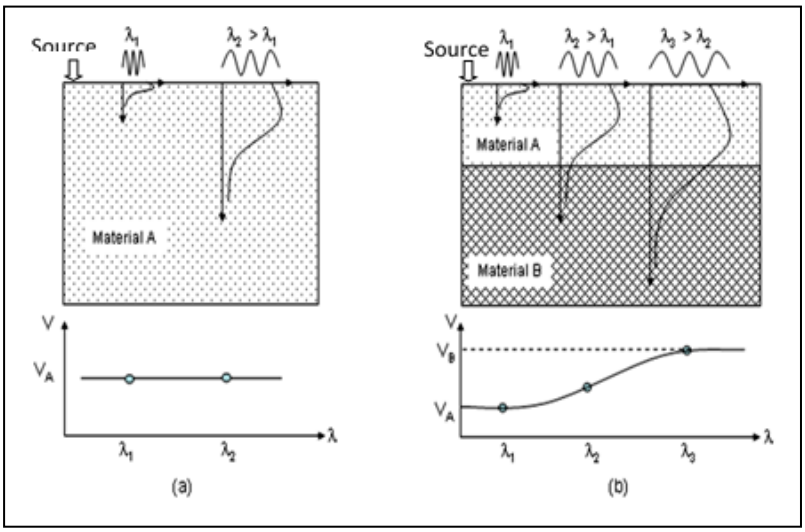


Figure 7 : Dispersion of Rayleigh wave depicting relationship between phase velocity (V) & wavelength (λ) for (a) vertically homogeneous medium, and (b) vertically heterogeneous medium.

The MASW study procedure includes data acquisition as well as processing to evaluate Rayleigh wave dispersion characteristics and finally inversion of the dispersion curve to determine 1-D & 2-D distribution of S-wave velocity up to 30m depth.

The field layout for data acquisition comprises a mechanical source (hammer) for generating the seismic wave. A linear array of 24 receivers (4.5 Hz vertical geophones) is deployed in a horizontal 69 m ground spread and connected to a multichannel seismograph recorder. In data acquisition the two parameters of importance are the source offset and the receiver spacing: The source offset is set according to the depth of probing, while receiver spacing is decided on the basis of desired resolution.

The data processing involves transformation of raw data from time to frequency domain by Fourier analysis. The frequency spectrum consists of body waves, fundamental mode & higher modes of Rayleigh wave and reflected/scattered waves. The “energy accumulation pattern recognition technique” is employed to extract

the fundamental mode Rayleigh wave for generating the dispersion curve which represents relationship between Rayleigh wave, phase velocity and frequency.

Finally, the extracted dispersion curve is used as a reference to back calculate the S-wave velocity variations with depth through inversion process. The procedure is an iterative process involving matching of theoretically developed dispersion curve of specific subsurface layer model with the field dispersion curve wherein a priori information about the site is used.

The seismic site characterization for calculating seismic hazard is usually carried out based on the near-surface shear wave velocity values.

6.2. Generation of 1-D And 2-D S-Wave Velocity Images

As per the desired application, the results of MASW study are presented either in the form of 1-D or 2-D image for visualizing the detailed status of the subsurface and evaluating the site characteristics. The procedure for generating S-wave velocity distribution in 1-D form is depicted in Figure 8.

The procedure for generating 2-D S-wave velocity image involves collection of data in a roll-along manner with fixed source-receiver configuration. Processing & inversion being done in an automated manner. Basically, the 2-D image includes 1-D observations combined through interpolation process and is portrayed in Figure 9.

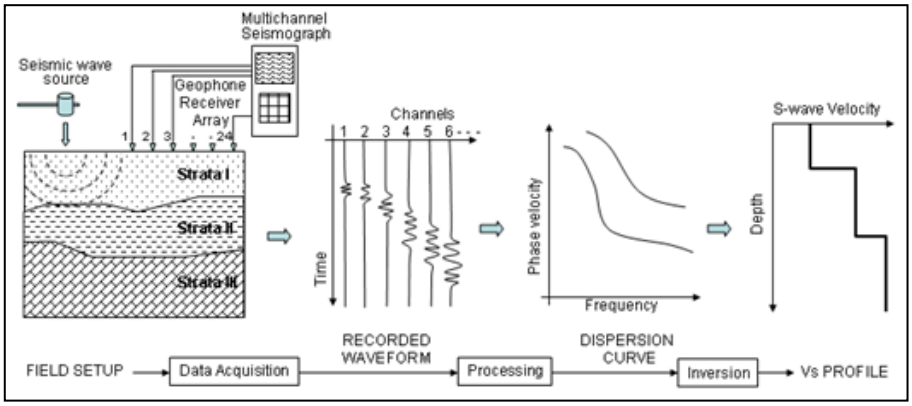


Figure 8 : Procedure for generating 1-D MASW Profile

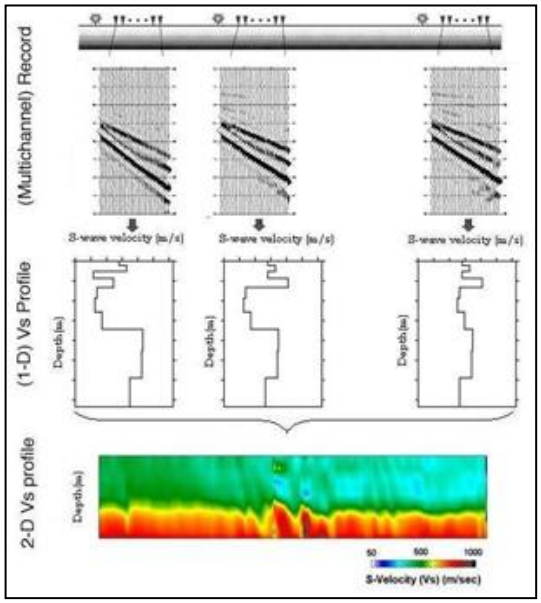


Figure 9 : Procedure for developing 2-D MASW Image.

Because of the merits of MASW technique, its application and advantages, it is gaining popularity as an efficient complimentary aid in reliably defining the subsurface condition.

6.3. Equipment and Source Details

The field set-up of the present MASW made use of the following parameters:

- Data acquisition unit : 24 Channel Signal enhancement digital seismograph (PASI Srl., Italy)
- Receivers 4.5 Hz. Vertical geophones
- Source type used 10 Kg Hammer
- Trigger mode Trigger Switch
- Channel spacing 3.0 m
- Sampling interval .200 msec.
- Recording duration 1 second
- No. of stacks 5-10 (As per site condition)
- Recording format SEG 2
- Data processing SeisImager/SW (Geometrics, USA)

6.4. Data Processing:

Analysis of the MASW data is carried out by SeisImager/SW software, where all the data set of a MASW spread is entered and automatic inversion process is started to evaluate velocity distribution in the subsurface. Seismic velocity sections thus obtained were interpreted in terms of geological cross sections along each seismic line.

The average shear wave velocity for the depth d of soil is referred to as VsH. The average shear wave velocity up to a depth of H (VsH) is computed as:

$$VsH = \sum di \,/\, \sum\left(\frac{di}{Vi}\right) \qquad (1)$$

Where, $\sum$di is the cumulative depth in meter. For 30-m depth, average shear wave velocity is calculated from:

$$Vs30 = \frac{30}{\sum_{i=1}^{i=N}\left(\frac{di}{Vi}\right)} \qquad (2)$$

Where di and vi denote the thickness (in meters) and shear wave velocity in m/s (at a shear strain level of 1025 or less) of the ith formation or layer, respectively, in a total of N layers, existing in the top 30 m. Calculated average shear wave velocity (Vs30) at different locations along the proposed alignment are represented on the middle of MASW spread.

6.5. Limitations of MASW Survey:

Like other geophysical methods it also has some limitations. In case of steep topography and soft ground condition, its application becomes limited. As in the case of other geophysical techniques, a priori information is helpful in improving MASW interpretation

7. DISCUSSION OF RESULTS

7.1. Details of Geophysical Survey Profiles and Data Acquisition

Geophysical survey has been conducted between Hebbel Esteem Mall junction to Silk Board KSRP junction. End coordinates and chainages of SRT and MASW are given in Table 1 and 2 respectively. Site photographs are given in Annexure-1.

Seismic refraction data of proposed profiles has been acquired by 24 channel seismic spread. Based on processed seismic refraction data, sections have been prepared for representation of subsurface stratigraphy along the proposed tunnel alignment. MASW survey was also conducted on those locations where vehicular and cultural noise was exceptionally high and space was limited.

Data of SR and MASW has been carefully examined, processed and the interpretation has been made. The findings of SRT and MASW are presented in the form of P-wave velocity sections and Shear wave velocity sections. The results brought out subsurface stratification showing variation in seismic velocity with depth.

Interpreted seismic sections are given in figure-10 to figure-27. Interpreted Shear wave velocity (MASW) sections and the Estimated Values of Vs30 are shown in Figure-28 to Figure-42.

Interpretation of each seismic refraction and MASW sections has been discussed separately.

7.2. Interpretation of Seismic refraction Sections AND MASW SECTIONS

Location wise description and interpretation of Seismic Refraction profiles and MASW profiles are given below:

Seismic Refraction Profiles:

7.2.1. Hebbal (SRT-1):

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 6 to 8 m along the profile. This layer has seismic velocity of the order of 430 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 1500 m/sec. This layer has been interpreted as consolidate strata comprising of sand and silt, which has thickness varying from 8 m to 11 m. This is further followed by a strata having seismic velocity of the order of 2569 m/sec, at depth varying from 14 m to 16 m, which is interpreted as moderately weathered rock. Seismic section of this profile is in shown in Figure-10.

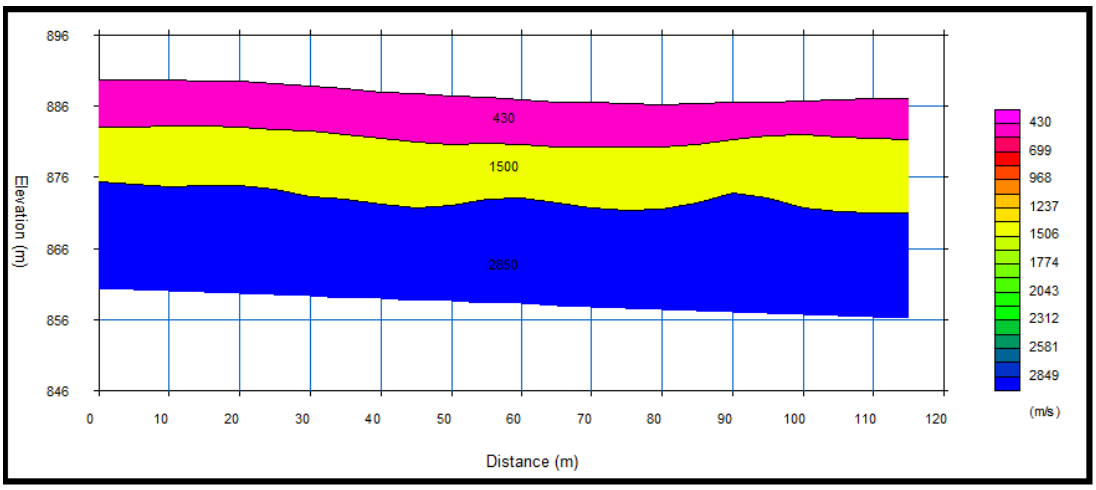


Figure 10 : Seismic Section of SRT-1.

7.2.2. In Prestige Group: (SRT-1A)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 5 to 6 m along the profile. This layer has seismic velocity of the order of 529 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 1635 m/sec. This layer has been interpreted as consolidate strata comprising of sand and silt, which has thickness varying from 10 m to 20 m. This is further followed by a strata having seismic velocity of the order of 2888 m/sec, at depth varying from 13 m to 22 m, which is interpreted as moderately weathered rock. Seismic section of this profile is in shown in Figure-11.

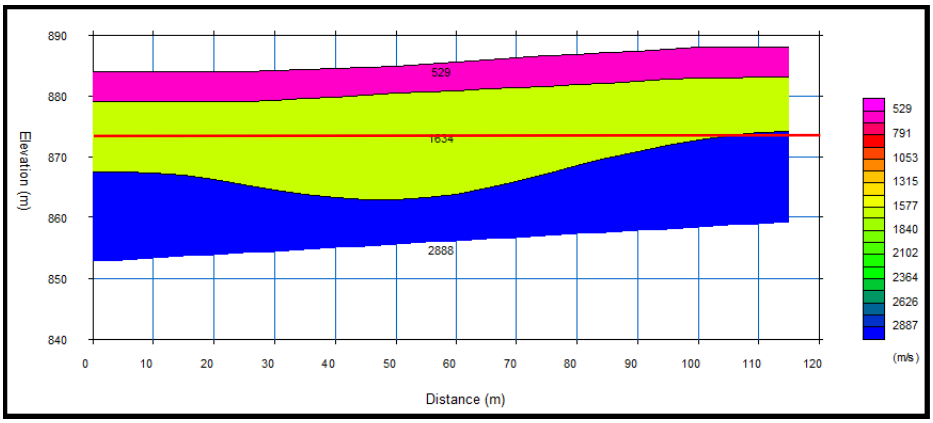


Figure 11 : Seismic Section of SRT-1A.

7.2.3. In Prestige Group (SRT-1B)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 5 to 8 m along the profile. This layer has seismic velocity of the order of 530 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 1539 m/sec. This layer has been interpreted as consolidate strata comprising of sand and silt, which has thickness varying from 9 m to 14 m. This is further followed by a strata having seismic velocity of the order of 3227m/sec, at depth varying from 16 m to 21 m, which is interpreted as slightly weathered rock. Seismic section of this profile is in shown in Figure-12.

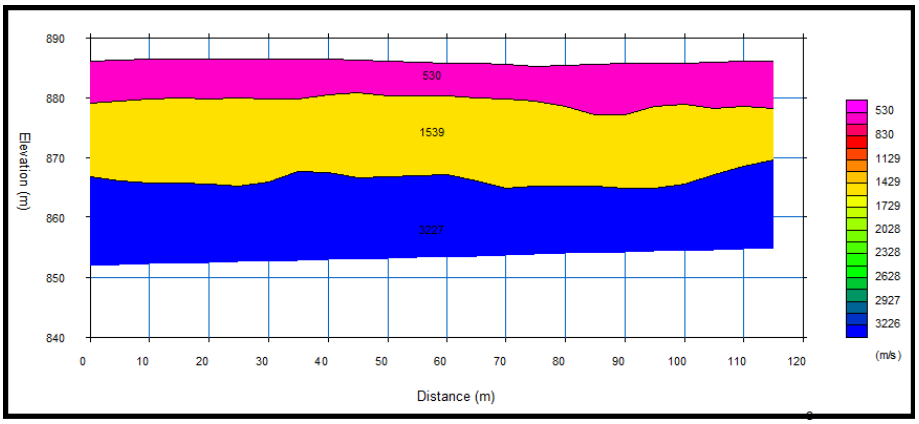


Figure 12 : Seismic Section of SRT-1B.

7.2.4. Near Bethal A.G. Church (SRT-1C)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 5 to 7 m along the profile. This layer has seismic velocity of the order of 472 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 1500 m/sec. This layer has been interpreted as consolidate strata comprising of sand and silt, which has thickness varying from 5 m to 9 m. This is further followed by a strata having seismic velocity of the order of 2589 m/sec, at depth varying from 12 m to 16 m, which is interpreted as slightly weathered rock. Seismic section of this profile is in shown in Figure-13.

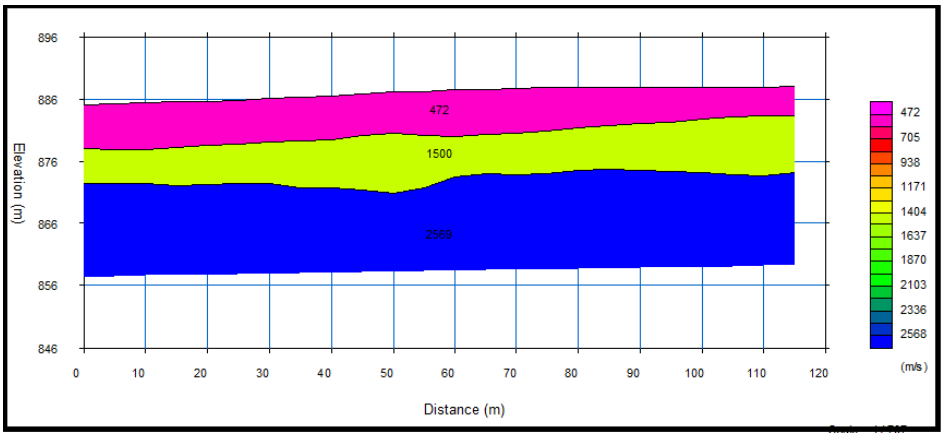


Figure 13 : Seismic Section of SRT-1C.

7.2.5. On Jayamahal Main Road (SRT-2)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 2.5 to 7 m along the profile. This layer has seismic velocity of the order of 400 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 869 m/sec. This layer has been interpreted as consolidate strata comprising of sand and silt, which has thickness varying from 16 m to 23 m. This is further followed by a strata having seismic velocity of the order of 1712 m/sec, at depth varying from 21 m to 26 m, which is interpreted as compacted strata. Seismic section of this profile is in shown in Figure-14.

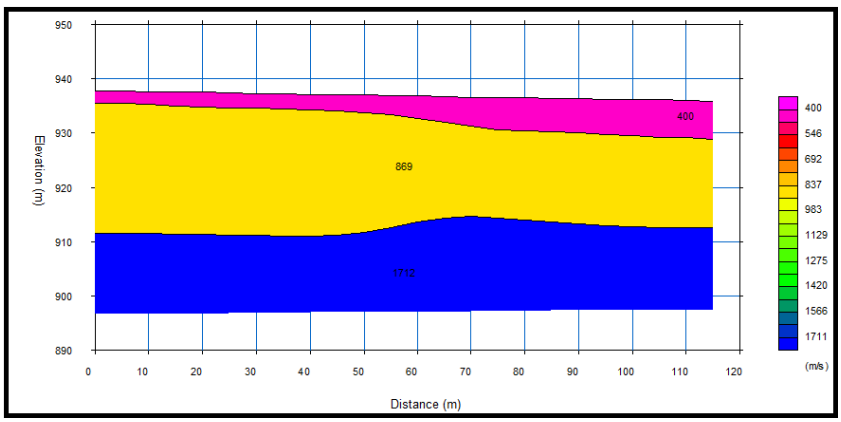


Figure 14 : Seismic Section of SRT-2.

7.2.6. **In Golf Course** (SRT-3)

One seismic refraction profile has been conducted to cover total proposed length of 200 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 1 to 10 m along the profile. This layer has seismic velocity of the order of 570 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 1617 m/sec. This layer has been interpreted as consolidate strata comprising of sand and silt or highly weathered/fracture rock, which has thickness varying from 3.5 m to 20 m. This is further followed by a strata having seismic velocity of the order of 3178 m/sec, at depth varying from 4 m to 26 m, which is interpreted as moderately to slightly weathered rock. Seismic section of this profile is in shown in Figure-15.

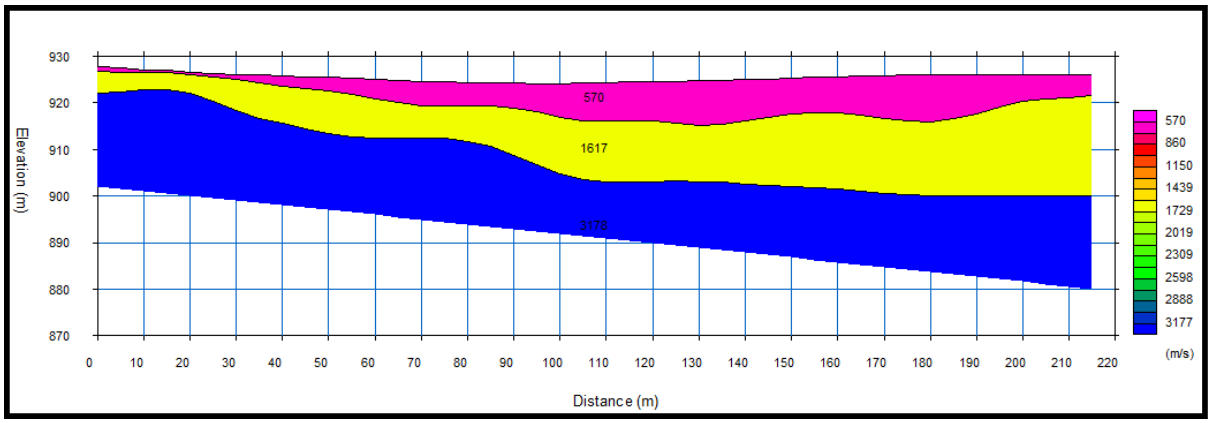


Figure-15: Seismic Section of SRT-3.

7.2.7. **In Race Course (SRT-4)**

One seismic refraction profile has been conducted to cover total proposed length of 235 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 0 to 8 m along the profile. This layer has seismic velocity of the order of 600 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 1500 m/sec. This layer has been interpreted as consolidate strata comprising of sand and silt, which has thickness varying from 1.5 m to 10 m. This is further followed by a strata having seismic velocity of the order of 2400 m/sec, at depth varying from 1 m to 16 m, which is interpreted as highly weathered rock. Seismic section of this profile is in shown in Figure-16.

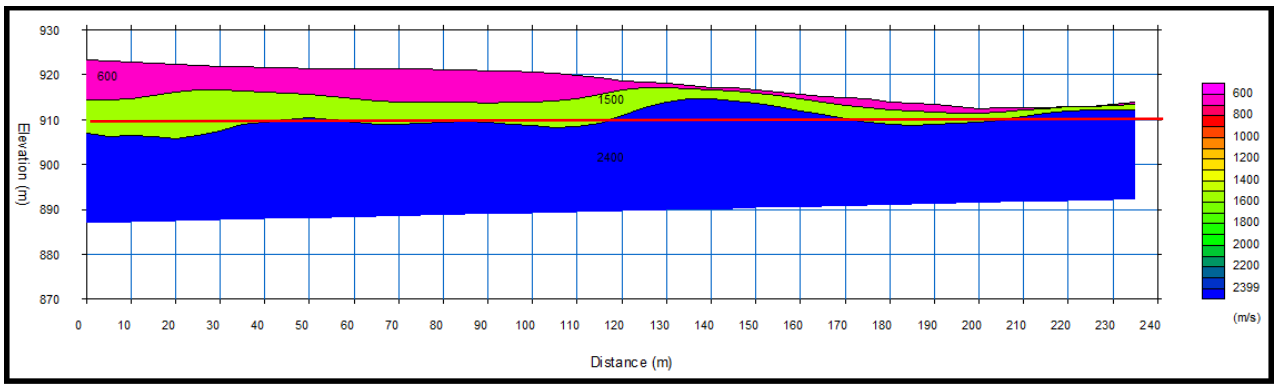


Figure 15 : Seismic Section of SRT-4.

7.2.8. In Race Course (SRT-5)

One seismic refraction profile has been conducted to cover total proposed length of 230 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 3 to 10 m along the profile. This layer has seismic velocity of the order of 450 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 1500 m/sec. This layer has been interpreted as consolidate strata comprising of sand and silt which has thickness varying from 6 m to 18 m. This is further followed by a strata having seismic velocity of the order of 2700 m/sec, at depth varying from 10 m to 26 m, which is interpreted as moderately weathered rock. Seismic section of this profile is in shown in Figure-17.

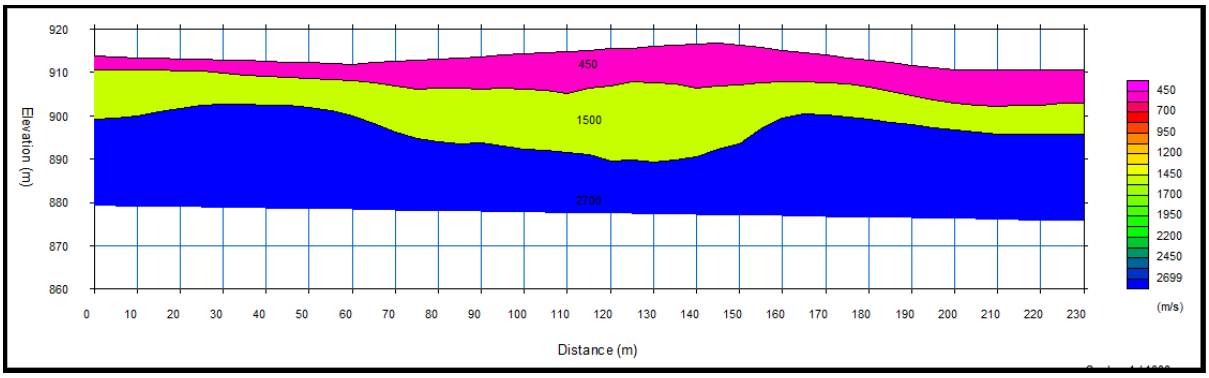


Figure-17: Seismic Section of SRT-5.

7.2.9. In Bengaluru University (SRT-6)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 0.5 to 13 m along the profile. This layer has seismic velocity of the order of 577 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 1864 m/sec. This layer has been interpreted as Highly weathered rock, which has thickness varying from 1.5 m to 17 m. This is further followed by a strata having seismic velocity of the order of 3400 m/sec, at depth varying from 1.5 m to 30 m, which is interpreted as relatively fresh. Depth of this layer is not confirm between 90 m to 115 m as may be deeper. Seismic section of this profile is in shown in Figure-18.

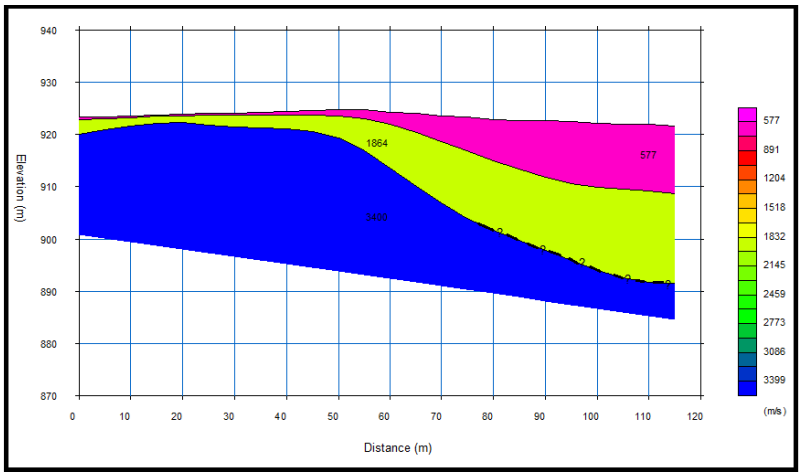


Figure 16 : Seismic Section of SRT-6.

7.2.10. Lal Bagh (SRT-7)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 3 to 6.5 m along the profile. This layer has seismic velocity of the order of 422 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 939 m/sec. This layer has been interpreted as consolidate strata comprising of sand and silt which has thickness varying from 8 m to 14 m. This is further followed by a strata having seismic velocity of the order of 3165 m/sec, at depth varying from 15 m to 18 m, which is interpreted as relatively fresh. Depth of this layer is not confirm between 90 m to 115 m as may be deeper. Seismic section of this profile is in shown in Figure-19.

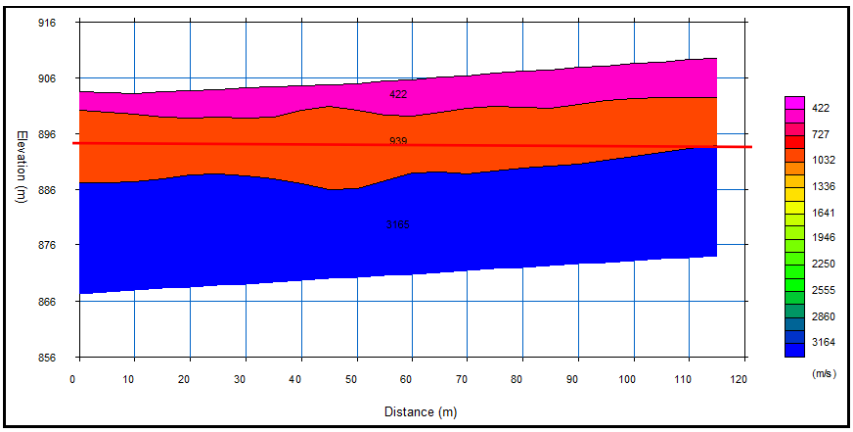


Figure-19: Seismic Section of SRT-7.

7.2.11. Lal Bagh (SRT-7A)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 0.5 to 8 m along the profile. This layer has seismic velocity of the order of 671 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 1887 m/sec. This layer has been interpreted as highly weathered rock, which has thickness varying from 0.8 m to 4 m. This is further followed by a strata having seismic velocity of the order of 3288 m/sec, at depth varying from 1 m to 12 m, which is interpreted as relatively fresh rock. Seismic section of this profile is in shown in Figure-20.

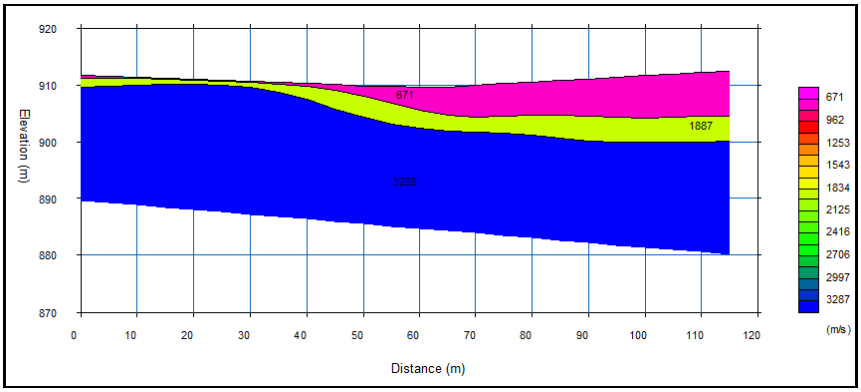


Figure 17 : Seismic Section of SRT-7A.

7.2.12. NIMHANS (SRT-9)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 2 to 3 m along the profile. This layer has seismic velocity of the order of 406 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 990 m/sec. This layer has been interpreted as consolidate strata comprising of sand and silt, which has thickness varying from 6 m to 10 m. This is further followed by a strata having seismic velocity of the order of 2676 m/sec, at depth varying from 9 m to 13 m, which is interpreted as moderately weathered rock. Seismic section of this profile is in shown in Figure-21.

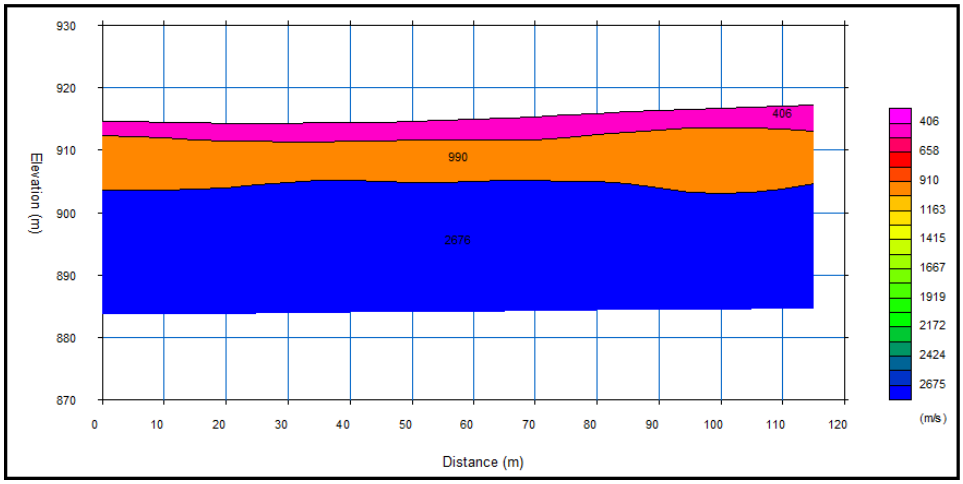


Figure 18 : Seismic Section of SRT-9

7.2.13. In Christ University (SRT-10)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 4 to 16 m along the profile. This layer has seismic velocity of the order of 471 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 821 m/sec. This layer has been interpreted as relatively consolidate strata comprising of sand and silt, which has thickness varying from 9 m to 17 m. This is further followed by a strata having seismic velocity of the order of 1695 m/sec, at depth varying from 20 m to 27 m, which is interpreted as compacted strata comprising of sand or highly weathered rock.. Seismic section of this profile is in shown in Figure-22.

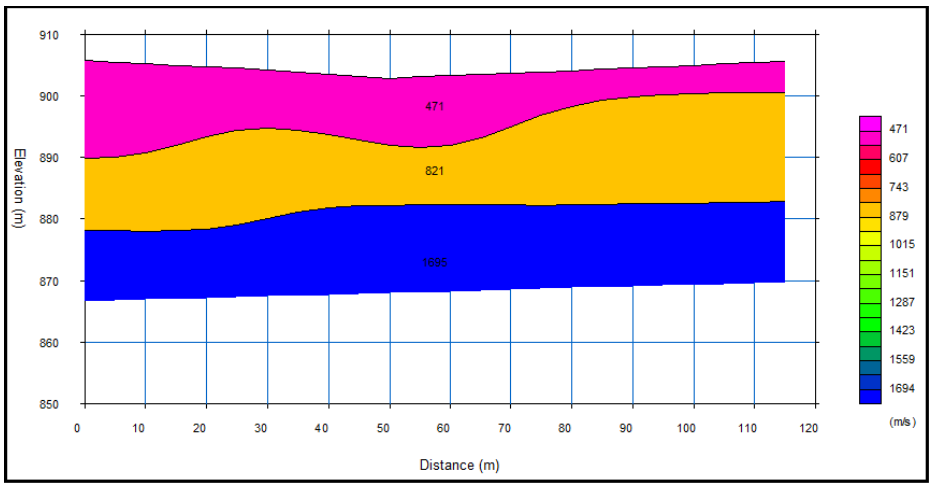


Figure 19 : Seismic Section of SRT-10.

7.2.14. ST. JOHNS (SRT-11A)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 12 to 19 m along the profile. This layer has seismic velocity of the order of 478 m/sec.

The top layer is followed by a strata having seismic velocity of the order of 3518 m/sec, at depth varying from 12 m to 19 m, which is interpreted as relatively fresh rock. Seismic section of this profile is in shown in Figure-23.

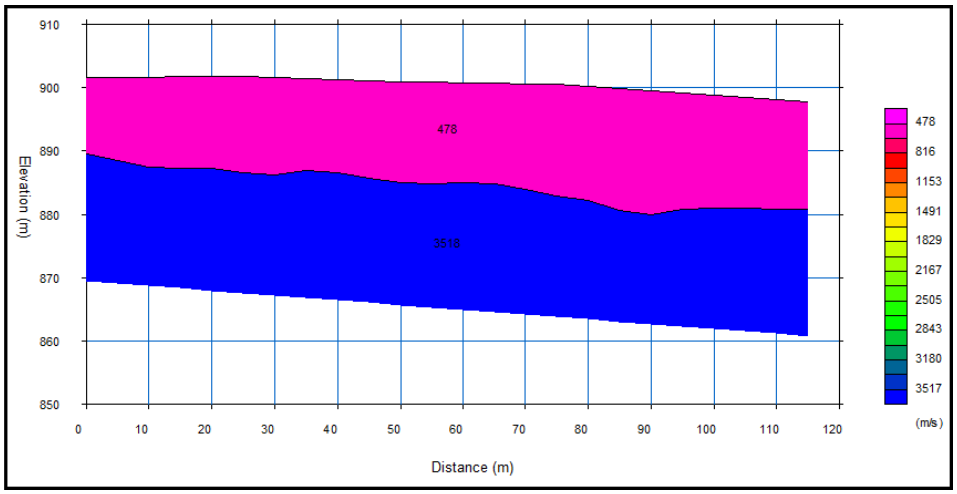


Figure 20 : Seismic Section of SRT-11A

7.2.15. ST. JOHNS. (SRT-11B)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data Three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 4 to 10 m along the profile. This layer has seismic velocity of the order of 472 m/sec.

The top layer is followed by an intermediate layer of relatively consolidated strata having seismic velocity of the order of 1086 m/sec. This layer has been interpreted as relatively consolidate strata comprising of sand and silt, which has thickness varying from 6 m to 13 m. This is further followed by a strata having seismic

velocity of the order of 2530 m/sec, at depth varying from 13 m to 20 m, which is interpreted as moderately weathered rock. Seismic section of this profile is in shown in Figure-24.

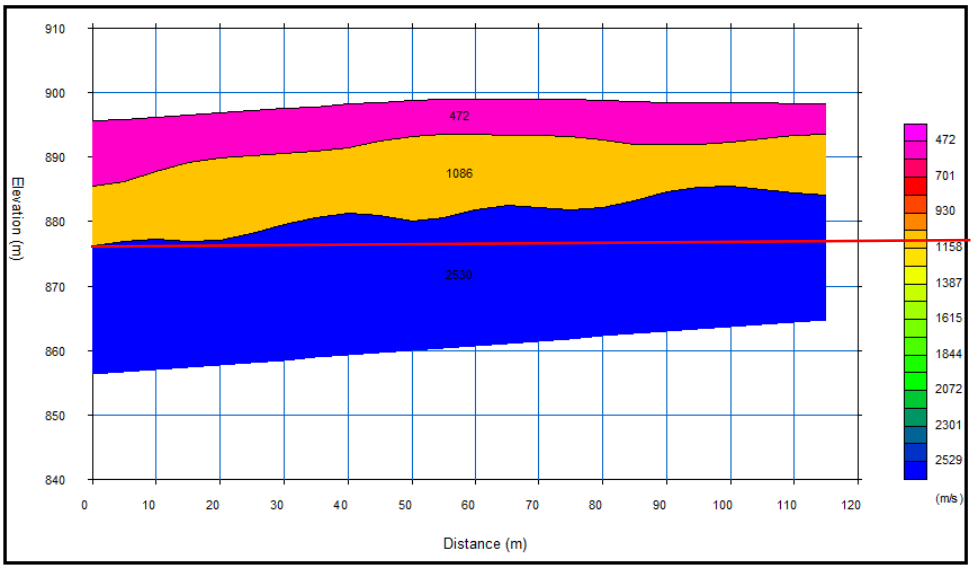


Figure 21 : Seismic Section of SRT-11B.

7.2.16. ST. JOHNS (SRT-12A)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 12 to 19 m along the profile. This layer has seismic velocity of the order of 678 m/sec.

The top layer is followed by a strata having seismic velocity of the order of 1510 m/sec, at depth varying from 22 m to 25 m, which is interpreted as consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. rock. Seismic section of this profile is in shown in Figure-25.

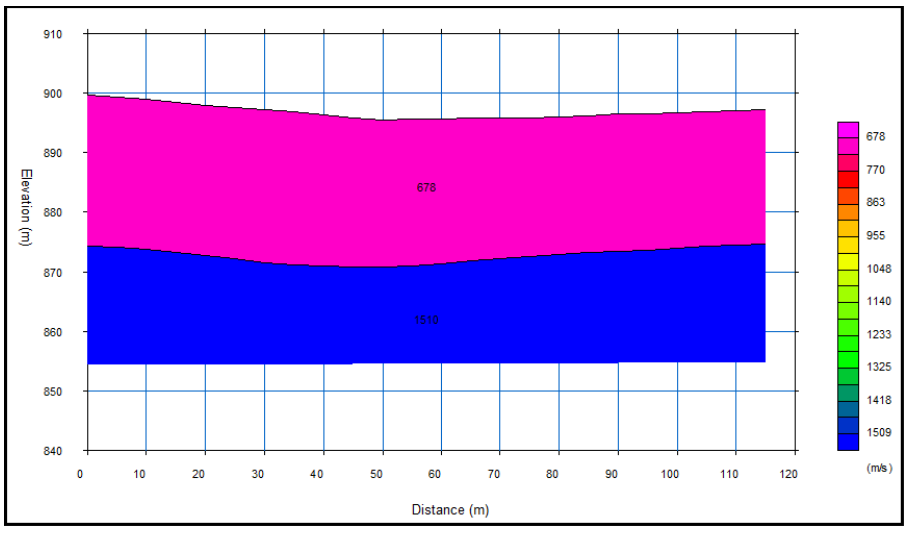


Figure 22 : Seismic Section of SRT-12A.

7.2.17. ST. JOHNS (SRT-12B)

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data two layer model has been established. Top layer comprises of

unconsolidated colluvium deposit having thickness varying from 12 to 19 m along the profile. This layer has seismic velocity of the order of 660 m/sec.

The top layer is followed by a strata having seismic velocity of the order of 1622 m/sec, at depth varying from 23 m to 24 m, which is interpreted as consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. rock. Seismic section of this profile is in shown in Figure-26.

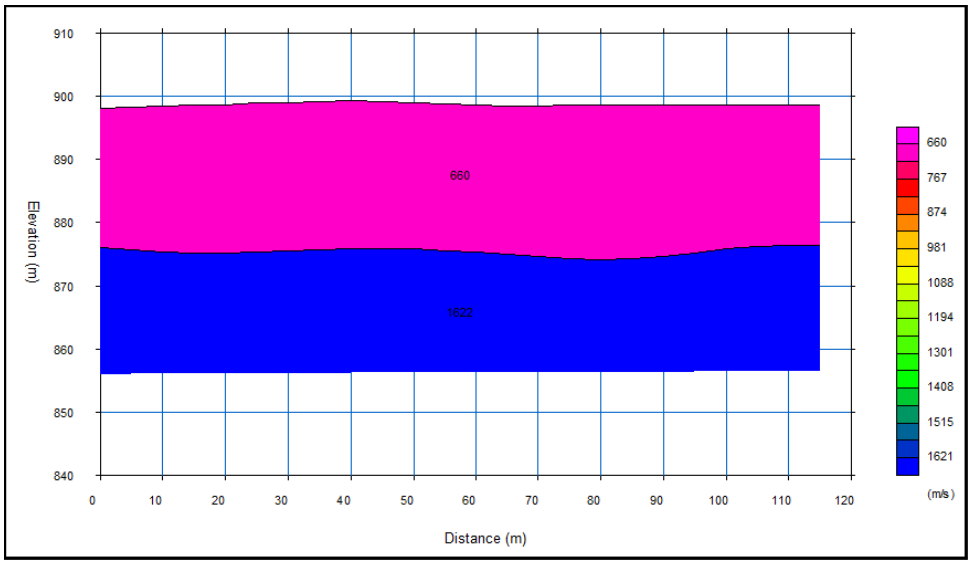


Figure 23 : Seismic Section of SRT-12B

7.2.18. ST. JOHNS (SRT-13):

One seismic refraction profile has been conducted to cover total proposed length of 115 m at this location. This profile passes through flat ground.

Based on the interpretation of seismic data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 15 to 16 m along the profile. This layer has seismic velocity of the order of 409 m/sec.

The top layer is followed by a strata having seismic velocity of the order of 1688 m/sec, at depth varying from 15 m to 16 m, which is interpreted as consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. rock. Seismic section of this profile is in shown in Figure-27.

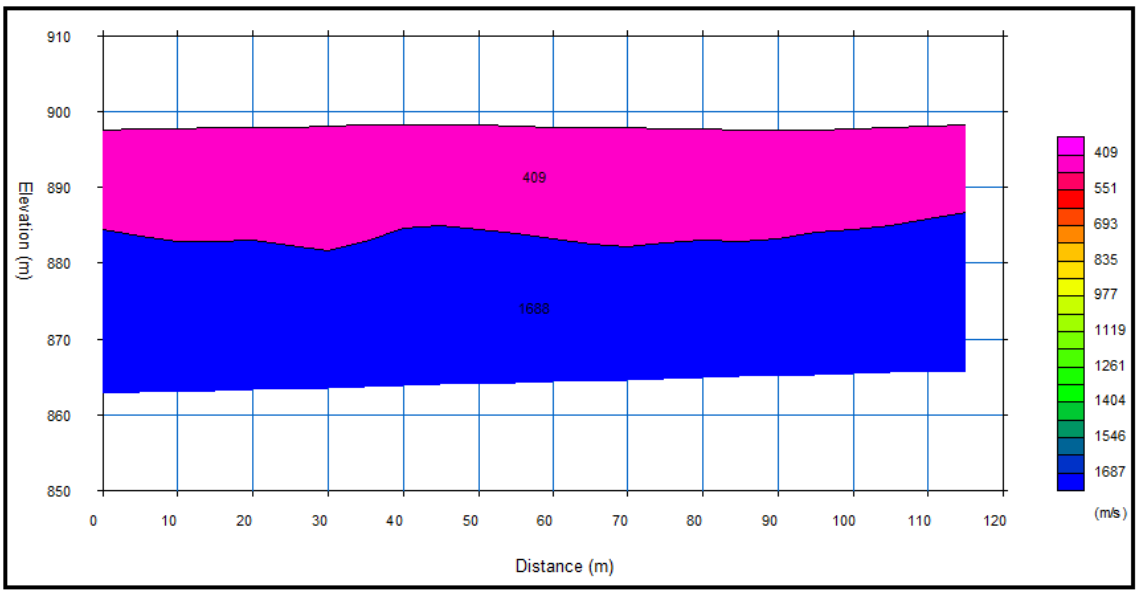


Figure-27: Seismic Section of SRT-13

MASW Shear Wave Profiles:

7.2.19. MASW-2:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 8 to 10 m along the profile. This layer has shear wave velocity of the order of 234 m/sec to 330 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 333 m/sec to 342 m/sec, at depth varying from 8 m to 10 m, which is interpreted as consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. Shear wave velocity section of this profile is in shown in Figure-28.

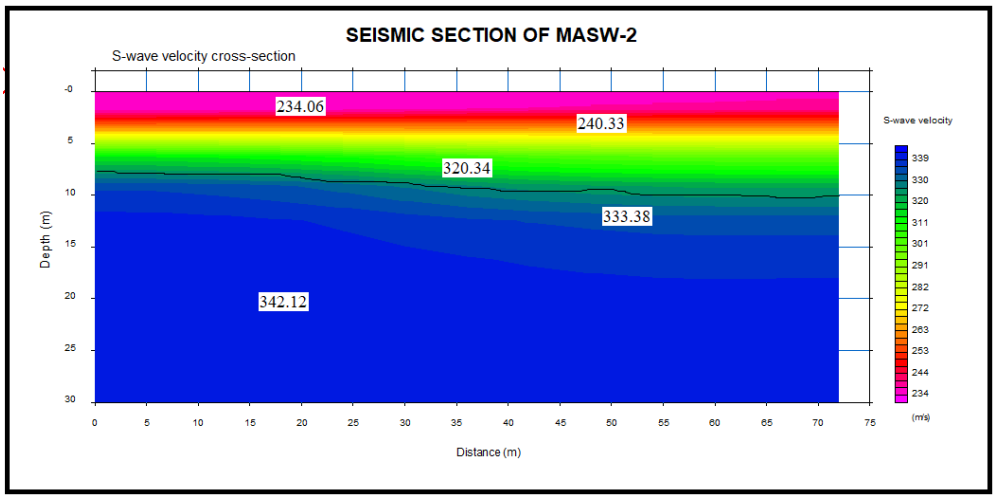


Figure 24 : Shear Wave Velocity Section of MASW-2

7.2.20. MASE-3:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 10 to 14 m along the profile. This layer has shear wave velocity of the order of 214 m/sec to 303 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 355 m/sec to 447 m/sec, at depth varying from 10 m to 14 m, which is interpreted as consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. Shear wave velocity section of this profile is in shown in Figure-29.

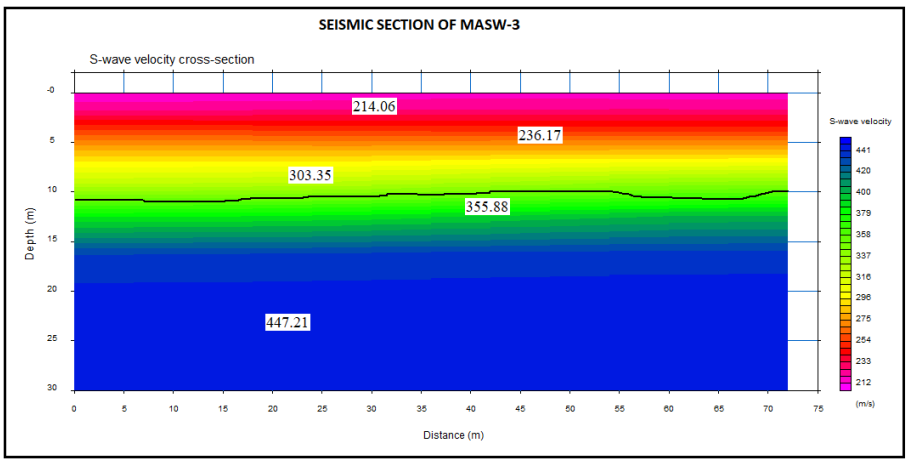


Figure 25 : Shear Wave Velocity Section of MASW-3.

7.2.21. MASW-4:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 7 to 9 m along the profile. This layer has shear wave velocity of the order of 261 m/sec to 380 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 390 m/sec to 532 m/sec, at depth varying from 7 m to 9 m, which is interpreted as consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. Shear wave velocity section of this profile is in shown in Figure-30.

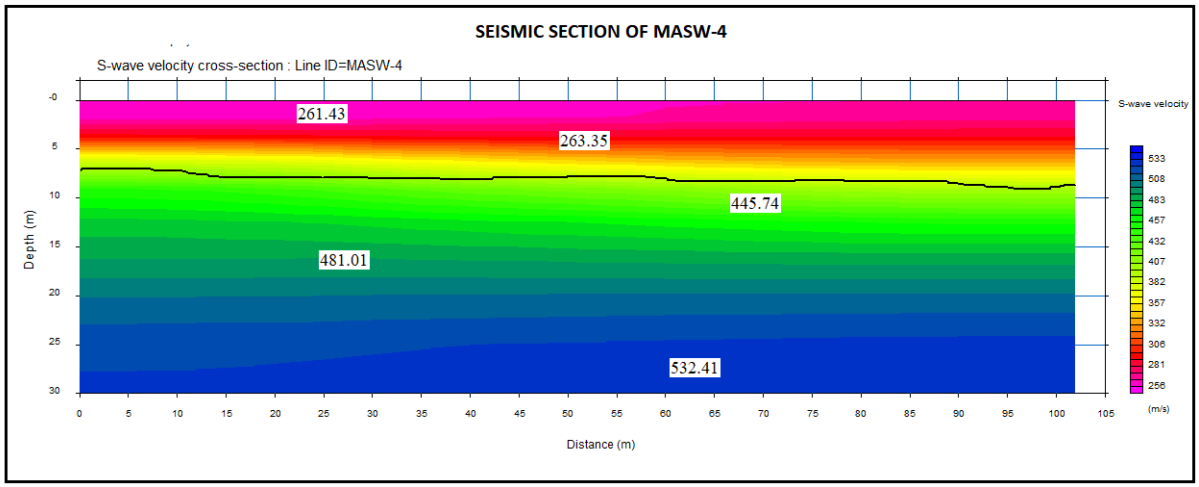


Figure 26 : Shear Wave Velocity Section of MASW-4.

7.2.22. MASW-5:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 11 to 12 m along the profile. This layer has shear wave velocity of the order of 301 m/sec to 320 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 346 m/sec to 487 m/sec, at depth varying from 11 m to 12 m, which is interpreted as consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. Shear wave velocity section of this profile is in shown in Figure-31.

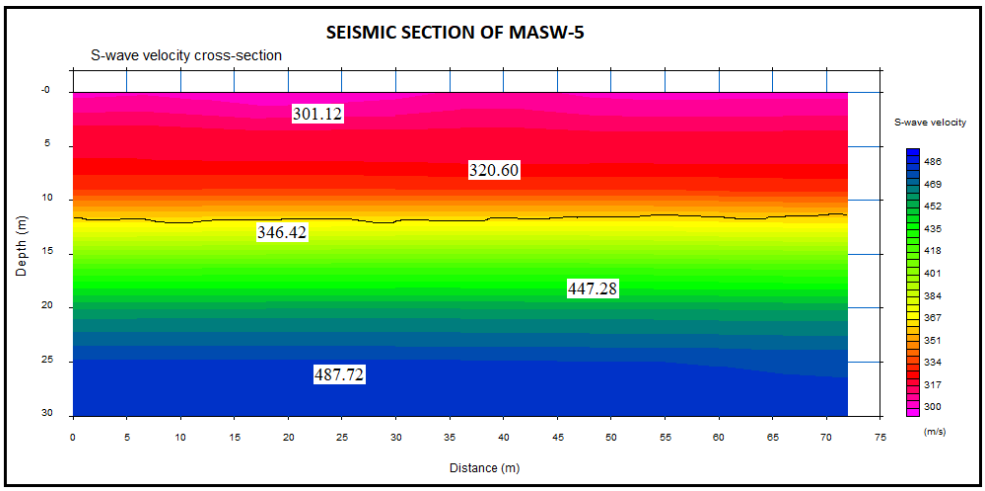


Figure 27 : Shear Wave Velocity Section of MASW-5.

7.2.23. MASW-6:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 7 m along the profile. This layer has shear wave velocity of the order of 265 m/sec to 347 m/sec.

The top layer is followed by an intermediate layer having shear wave velocity of the order of 416 m/sec to 643 m/sec, having thickness varying from 11 m to 12 m, which is interpreted as consolidated strata comprising of sand and silt. This is further followed by a layer having shear wave velocity of the order of 784 m/sec 836 m/sec, which is interpreted as highly weathered rock. Depth to the top of this layer is of the order of 18 m to 19 m.Shear wave velocity section of this profile is in shown in Figure-32.

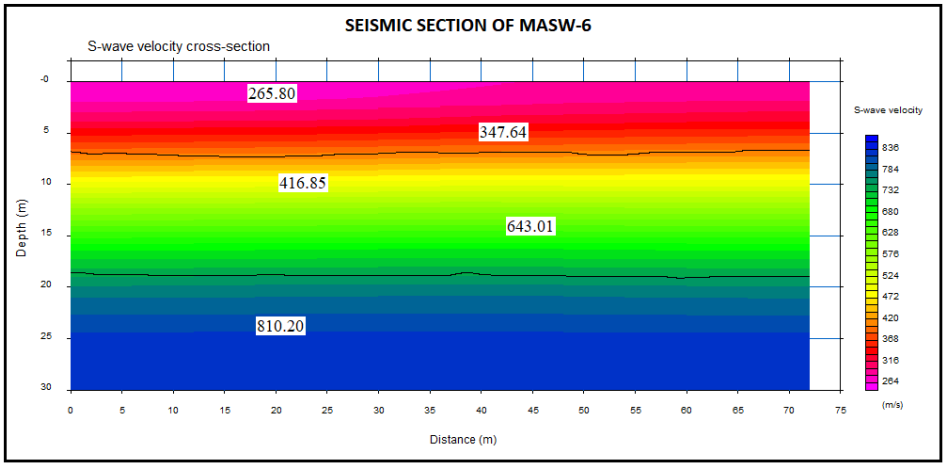


Figure 28 : Shear Wave Velocity Section of MASW-6.

7.2.24. MASW-7:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 5 to 6 m along the profile. This layer has shear wave velocity of the order of 198 m/sec to 375 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 384 m/sec to 582 m/sec, at depth varying from 5 m to 6 m, which is interpreted as consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. Shear wave velocity section of this profile is in shown in Figure-33.

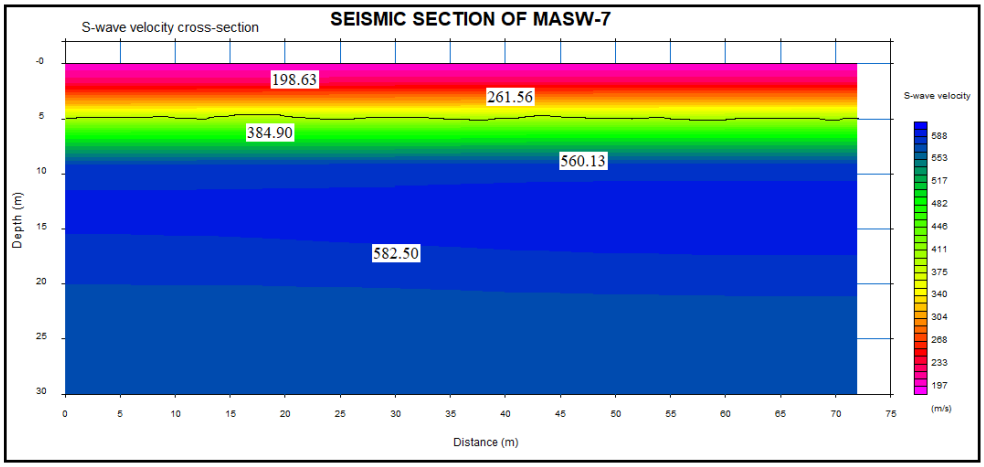


Figure 29 : Shear Wave Velocity Section of MASW-7.

7.2.25. MASW-8:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 4 m to 5 m along the profile. This layer has shear wave velocity of the order of 253 m/sec to 284 m/sec.

The top layer is followed by an intermediate layer having shear wave velocity of the order of 393 m/sec to 516 m/sec, having thickness varying from 5 m to 6 m, which is interpreted as consolidated strata comprising of sand and silt. This is further followed by a layer having shear wave velocity of the order of 670 m/sec, which is interpreted as highly weathered rock. Depth to the top of this layer is of the order of 11 m to 12 m. Shear wave velocity section of this profile is in shown in Figure-34.

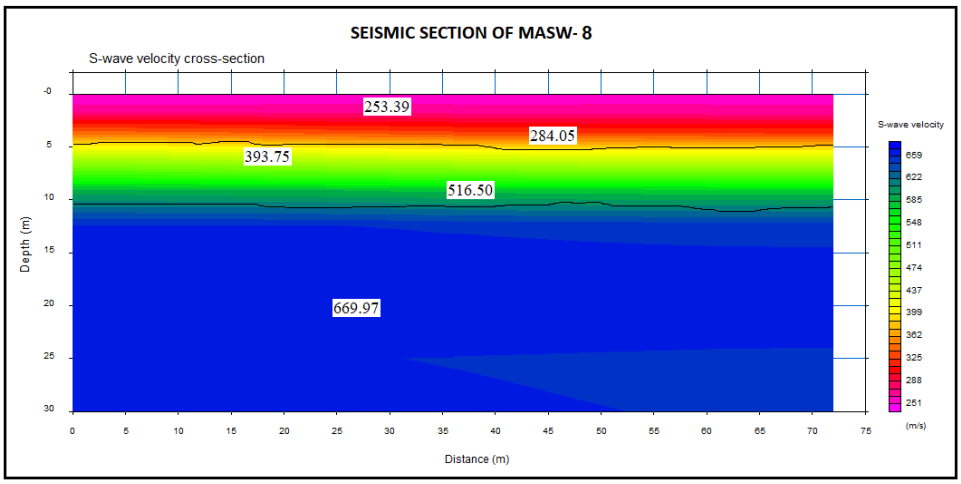


Figure 30 : Shear Wave Velocity Section of MASW-8.

7.2.26. MASW-9:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 11 to 12 m along the profile. This layer has shear wave velocity of the order of 301 m/sec to 320 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 346 m/sec to 487 m/sec, at depth varying from 11 m to 12 m, which is interpreted as consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. Shear wave velocity section of this profile is in shown in Figure-35.

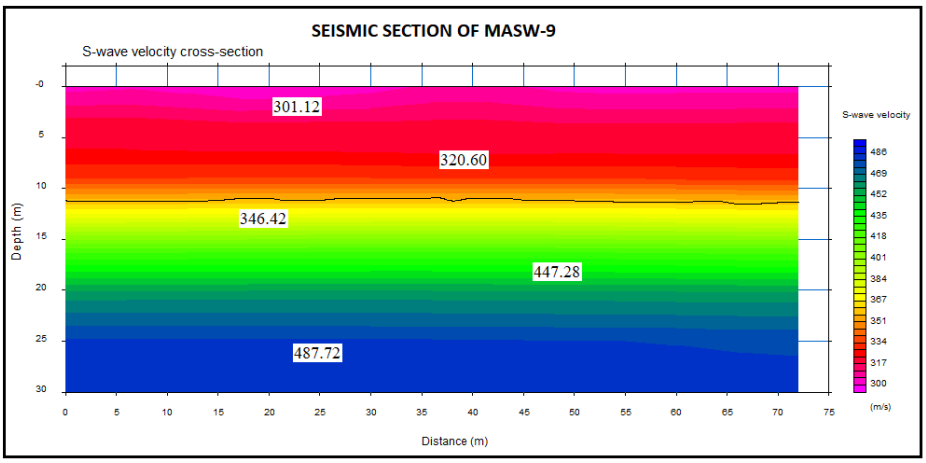


Figure 31 : Shear Wave Velocity Section of MASW-9.

7.2.27. MASW-9A:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 7 to 9 m along the profile. This layer has shear wave velocity of the order of 296 m/sec to 305 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 318 m/sec to 405 m/sec, at depth varying from 7 m to 9 m, which is interpreted as consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. Shear wave velocity section of this profile is in shown in Figure-36.

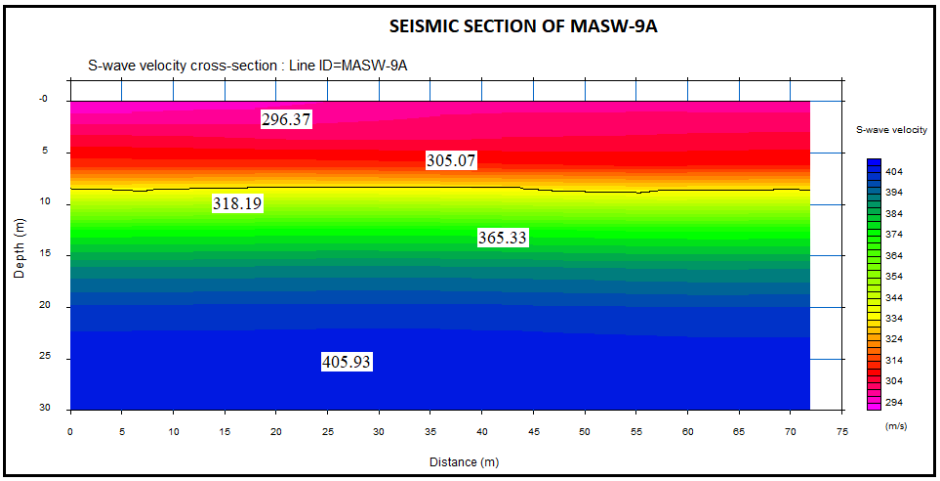


Figure 32 : Shear Wave Velocity Section of MASW-9A.

7.2.28. MASW-10:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 8 to 9 m along the profile. This layer has shear wave velocity of the order of 263 m/sec to 307 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 370 m/sec to 455 m/sec, at depth varying from 8 m to 9 m, which is interpreted as consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. Shear wave velocity section of this profile is in shown in Figure-37.

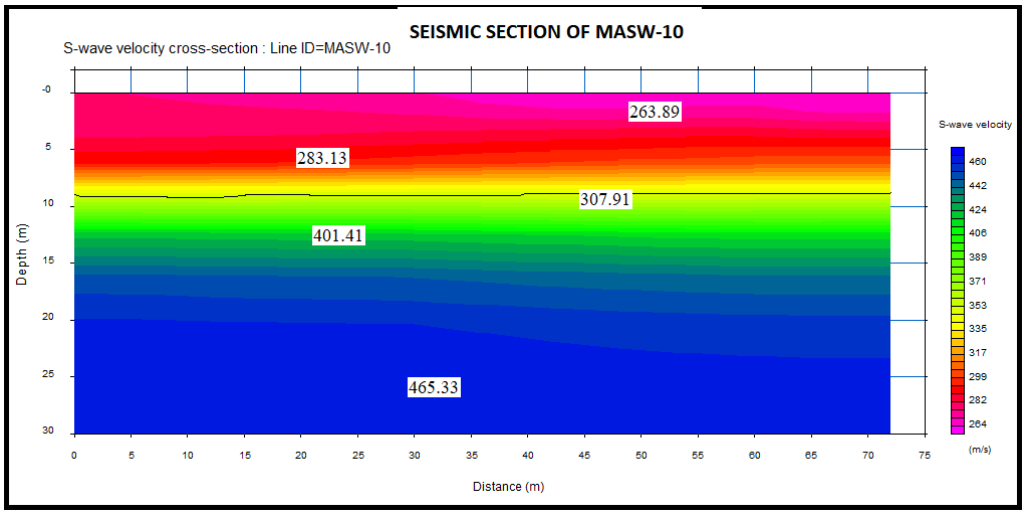


Figure-37: Shear Wave Velocity Section of MASW-10.

7.2.29. MASW-11:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data three layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 6 to 7 m along the profile. This layer has shear wave velocity of the order of 298 m/sec to 390 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 390 m/sec to 624 m/sec, having thickness varying from 7 m to 8 m, which is interpreted as consolidated strata comprising of sand and silt. This layer is followed by a layer having shear wave velocity varying from 758 m/sec to 817 m/sec, which is interpreted as highly weathered rock. Shear wave velocity section of this profile is in shown in Figure-38.

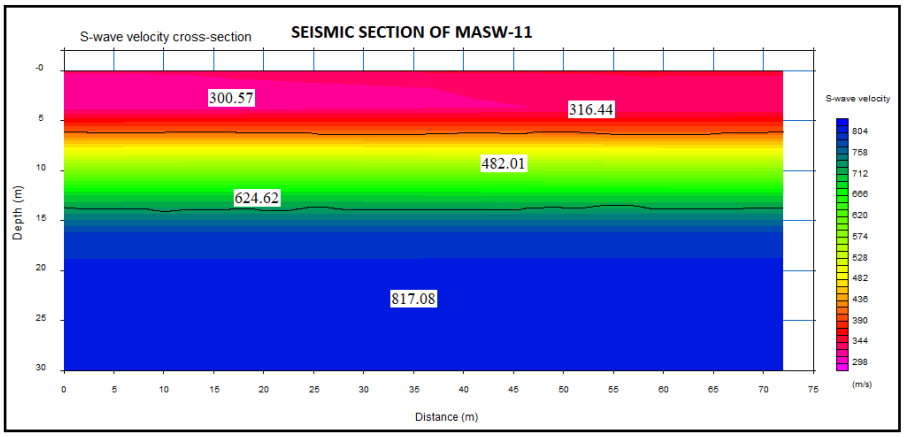


Figure-38: Shear Wave Velocity Section of MASW-11

7.2.30. MASW-12:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data three layer model has been established. Top layer comprises of highly weathered rocl having thickness varying from 4 to 5 m along the profile. This layer has shear wave velocity of the order of 977 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 1067 m/sec to 1291 m/sec, having thickness varying from 8 m to 10 m, which is interpreted as Moderately weathered rock. This layer is followed by a layer having shear wave velocity varying from 1300 m/sec to 2031 m/sec, which is interpreted as hard rock. Shear wave velocity section of this profile is in shown in Figure-39.

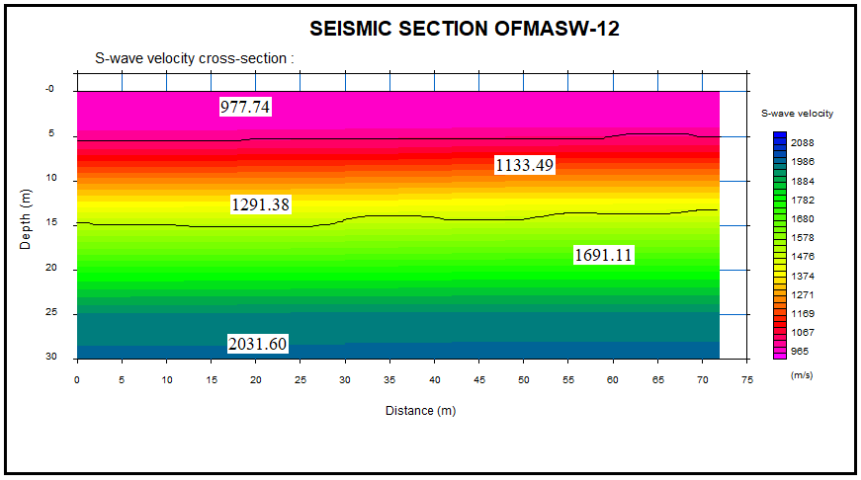


Figure-39: Shear Wave Velocity Section of MASW-12.

7.2.31. MASW-13:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 6 to 7 m along the profile. This layer has shear wave velocity of the order of 198 m/sec to 370 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 397 m/sec to 648 m/sec, at depth varying from 8 m to 9 m, which is interpreted as consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. Shear wave velocity section of this profile is in shown in Figure-40.

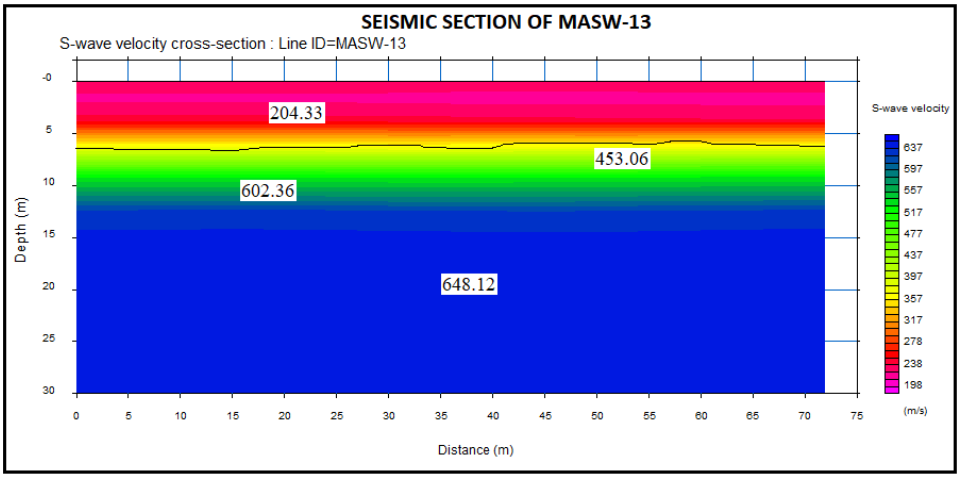


Figure 33 : Shear Wave Velocity Section of MASW-13.

7.2.32. MASW-14:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 4 to 5 m along the profile. This layer has shear wave velocity of the order of 238 m/sec to 267 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 209 m/sec to 360 m/sec, at depth varying from 4 m to 5 m, which is interpreted as relatively consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. Shear wave velocity section of this profile is in shown in Figure-41.

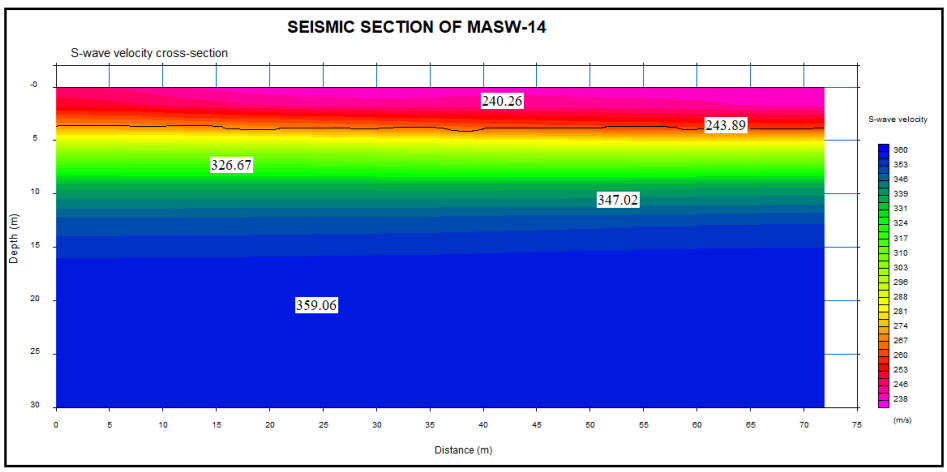


Figure 34 : Shear Wave Velocity Section of MASW-14.

7.2.33. MASW-15:

One MASW profile has been conducted to cover total proposed length of 69 m at this location. This profile passes through flat ground.

Based on the interpretation of MASW data two layer model has been established. Top layer comprises of unconsolidated colluvium deposit having thickness varying from 3 to 4 m along the profile. This layer has shear wave velocity of the order of 273 m/sec to 300 m/sec.

The top layer is followed by a strata having shear wave velocity of the order of 300 m/sec to 350 m/sec, at depth varying from 3 m to 4 m, which is interpreted as relatively consolidated strata comprising of sand and silt. No rock has been inferred up to 25 m depth. Shear wave velocity section of this profile is in shown in Figure-42.

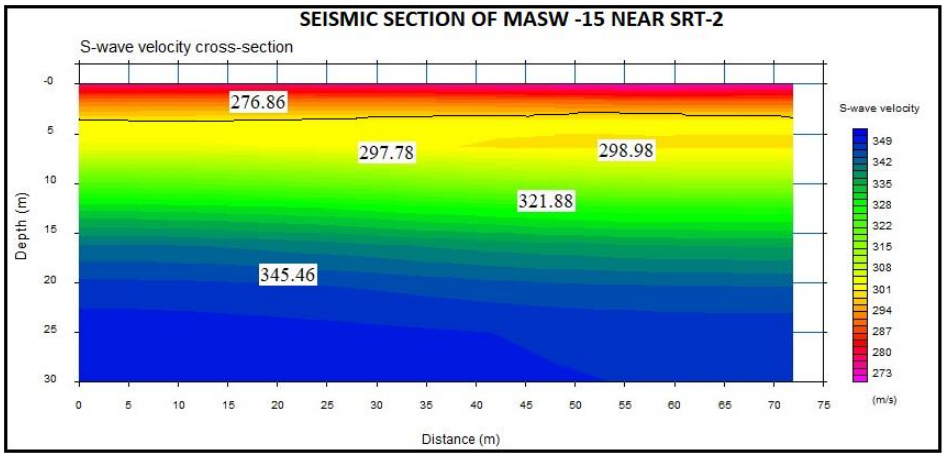


Figure 35 : Shear Wave Velocity Section of MASW-15.

8. CONCLUSIONS AND RECOMENDATIONS

Geophysical investigation in the form of seismic refraction and MASW survey has been planned and carried out for the proposed tunnel alignment between Hebbal Esteem Mall Junction to Silk Board KSRP Junction.

The objective of the geophysical investigation was to map the thickness, of overburden and bedrock bed rock profile.

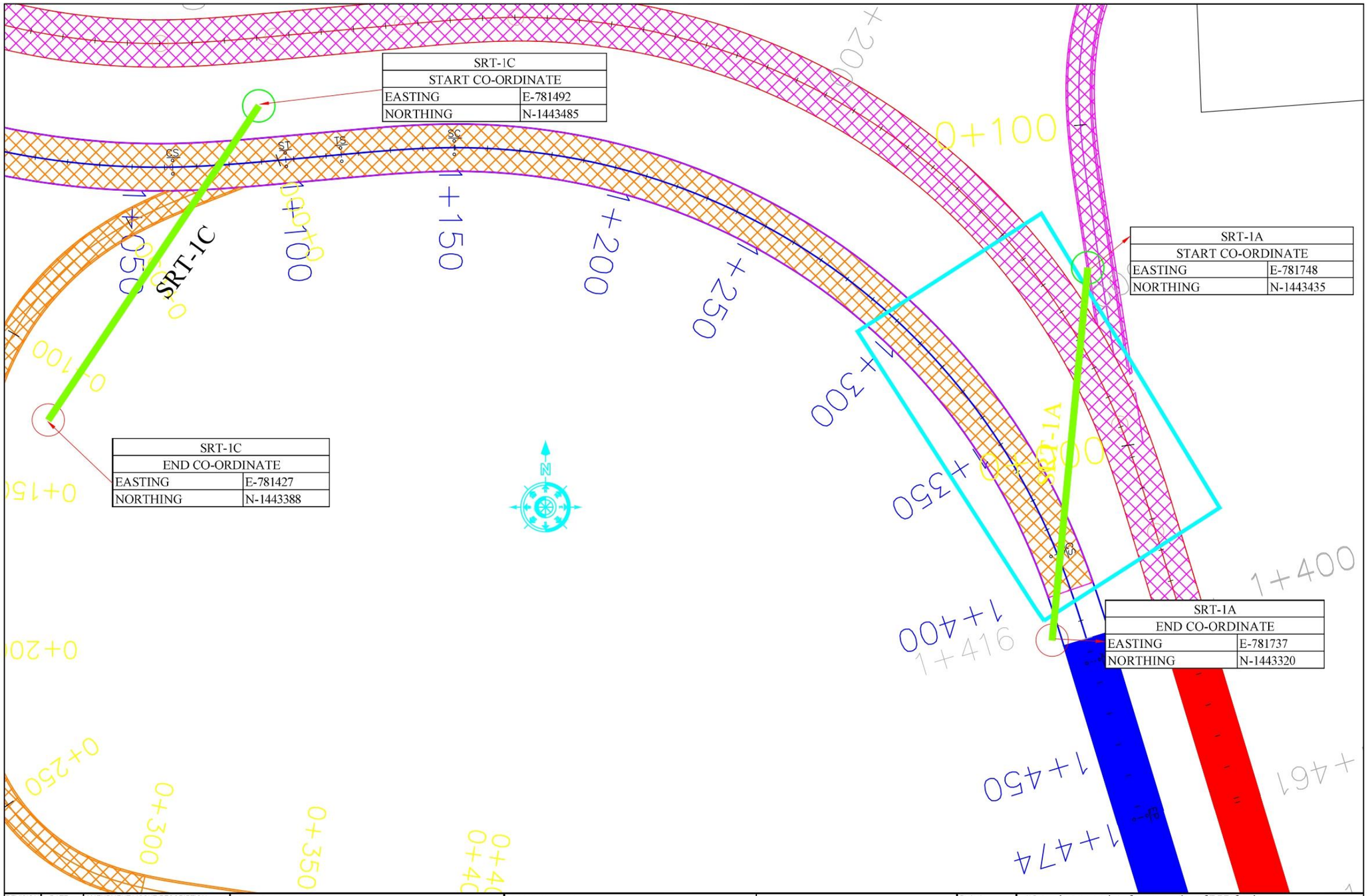
Interpretation of the acquired data has been done with the reference to published literature and available geological information of the project.

Two to Three-layer velocity models have been established based on the interpretation of the acquired Seismic Refraction data. In this study, the 1st layer is interpreted unconsolidated loose soil comprising of colluvium deposits and 2nd layer interpreted is consolidated soil or highly weathered rock. The 3rd layer has been inferred highly weathered rock and hard rock. Two layer model has been established at some locations where top layer is unconsolidated soil and second layer is either rock or consolidated strata.

Present geophysical study has covered all the locations on the proposed alignment by some of the locations due to restriction imposed by space and road.

By analysing the results of seismic refraction survey, it is found that the rock (third layer) encountered along the alignment has poor to fair bearing strata. By correlating the velocity with the Q system as per the available literature, it is concluded that sufficient rock support needs to be provided in the tunnel. As entire work was conducting either along busy road or in the premised of institutions, the SRT & MASW data has substantial noise due to vehicular movement on adjacent road and the noise from activities nearby owing to which the interpretation of SRT and MASW data may have error and needs to be carefully correlated by available geological and geotechnical informations. Apart from this, it is however strongly recommended to carry out further investigations by means of exploratory drilling and by detailed geological mapping to confirm the ground condition which will be used in detail engineering stage for the project.

ANNEXURE - 1 - LOCATION PLAN



REVISION	DATE	AMENDMENT \ ISSUE DESCRIPTION
R0	OCT. 2024	-

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GOVERNMENT OF KARNATAKA
GOVERNMENT OF KARANATAKA
Bruhat Bangalore Mahanagara Palike

CONSULTANT:
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CULTURAL CENTRE BUILDING
NEW DELHI - 110001 (INDIA)
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GEOPHYSICAL SURVEY REPORT

Designed:
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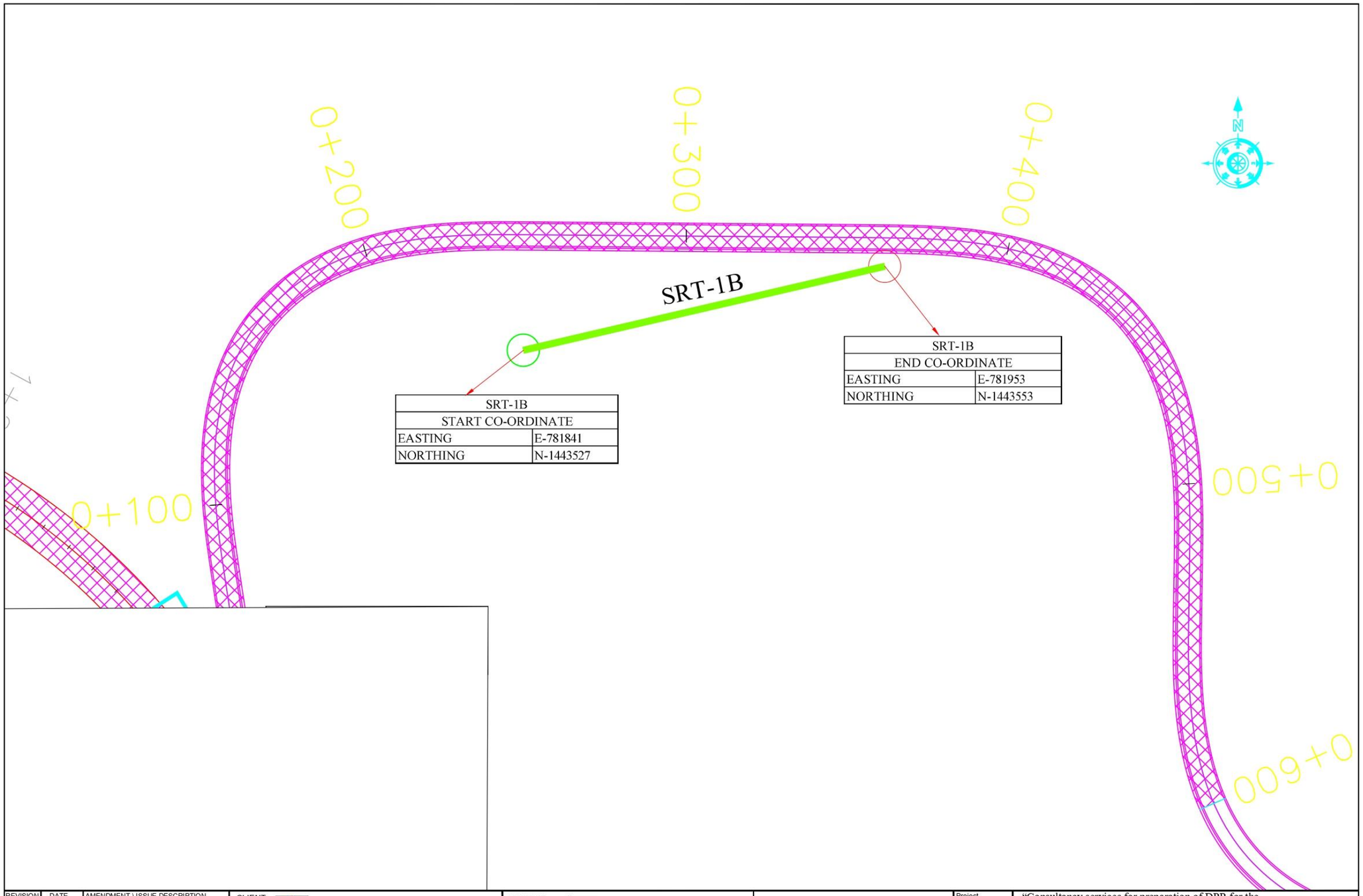
Checked:
Approved:
Scale :- 1:1500
Sheet size: A3

Project	"Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 01



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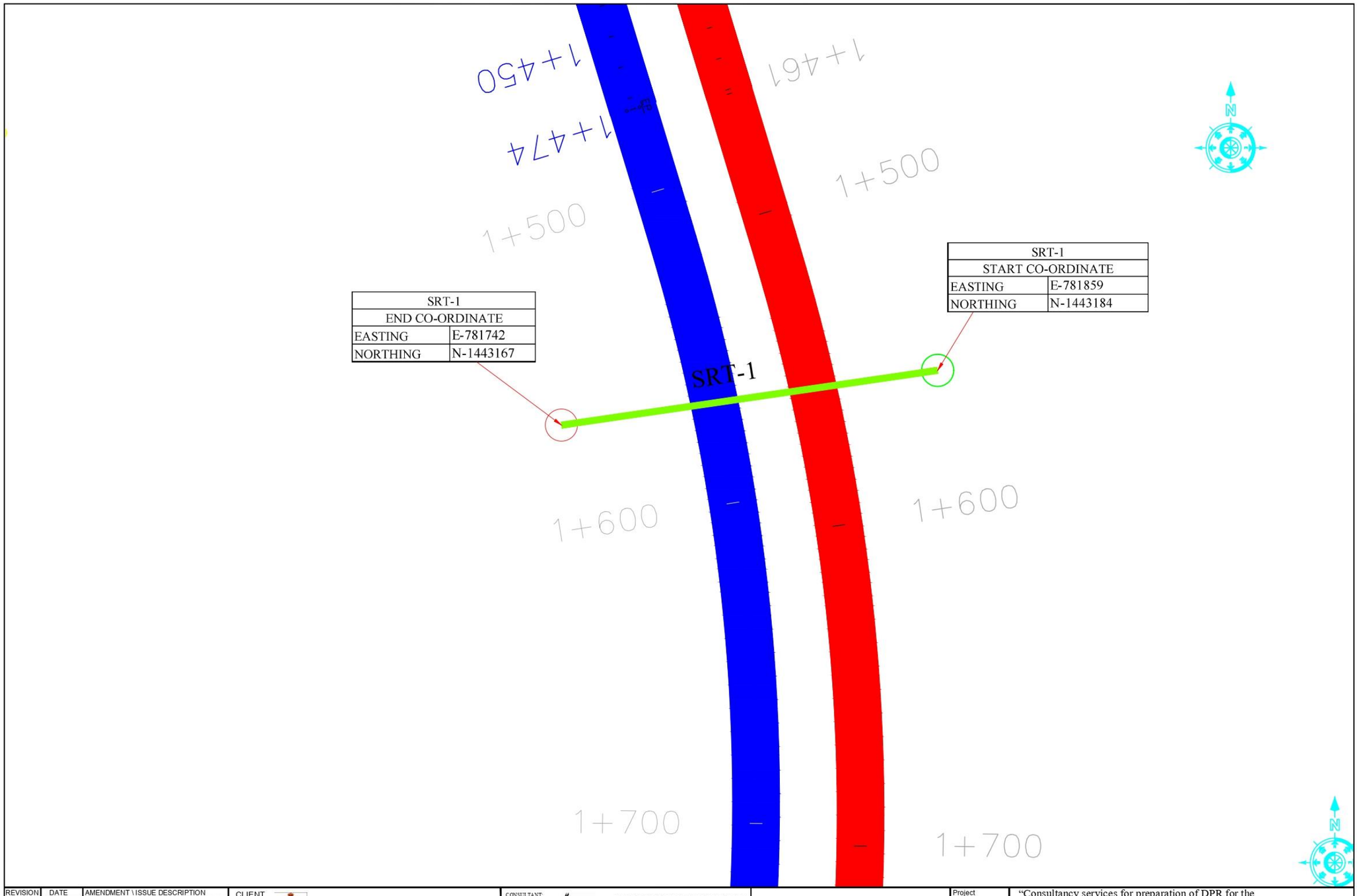
Drawing Title: GEOPHYSICAL SURVEY PLAN

Drawing No.: RC/1640/HO/HBT/TU/DWG/ 02



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R0	OCT. 2024	-

CLIENT: GOVERNMENT OF KARNATAKA
GOVERNMENT OF KARANATAKA
Bruhat Bangalore Mahanagara Palike

CONSULTANT: **RODIC CONSULTANTS PVT. LTD.**
1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING
NEW DELHI - 110001 (INDIA)
Integrated Geophysical & Geological Services
163-B/2, Ground Floor, Urfi Apartment, Jogabai, Jamia Nagar

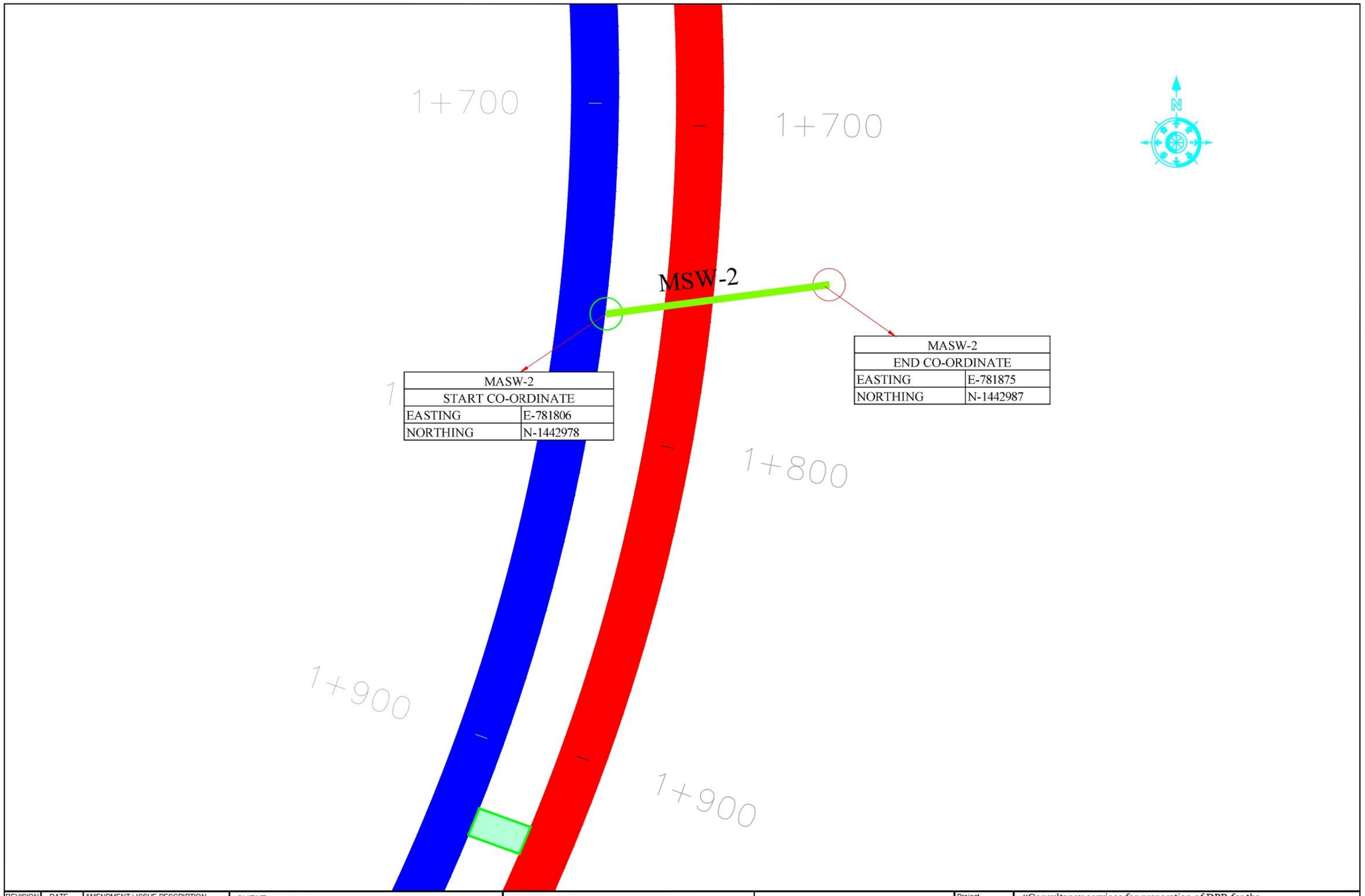
GEOPHYSICAL SURVEY REPORT

Designed: | Drawn: | Checked: | Approved:

Scale :- 1:1500

Sheet size: A3

Project	"Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 03



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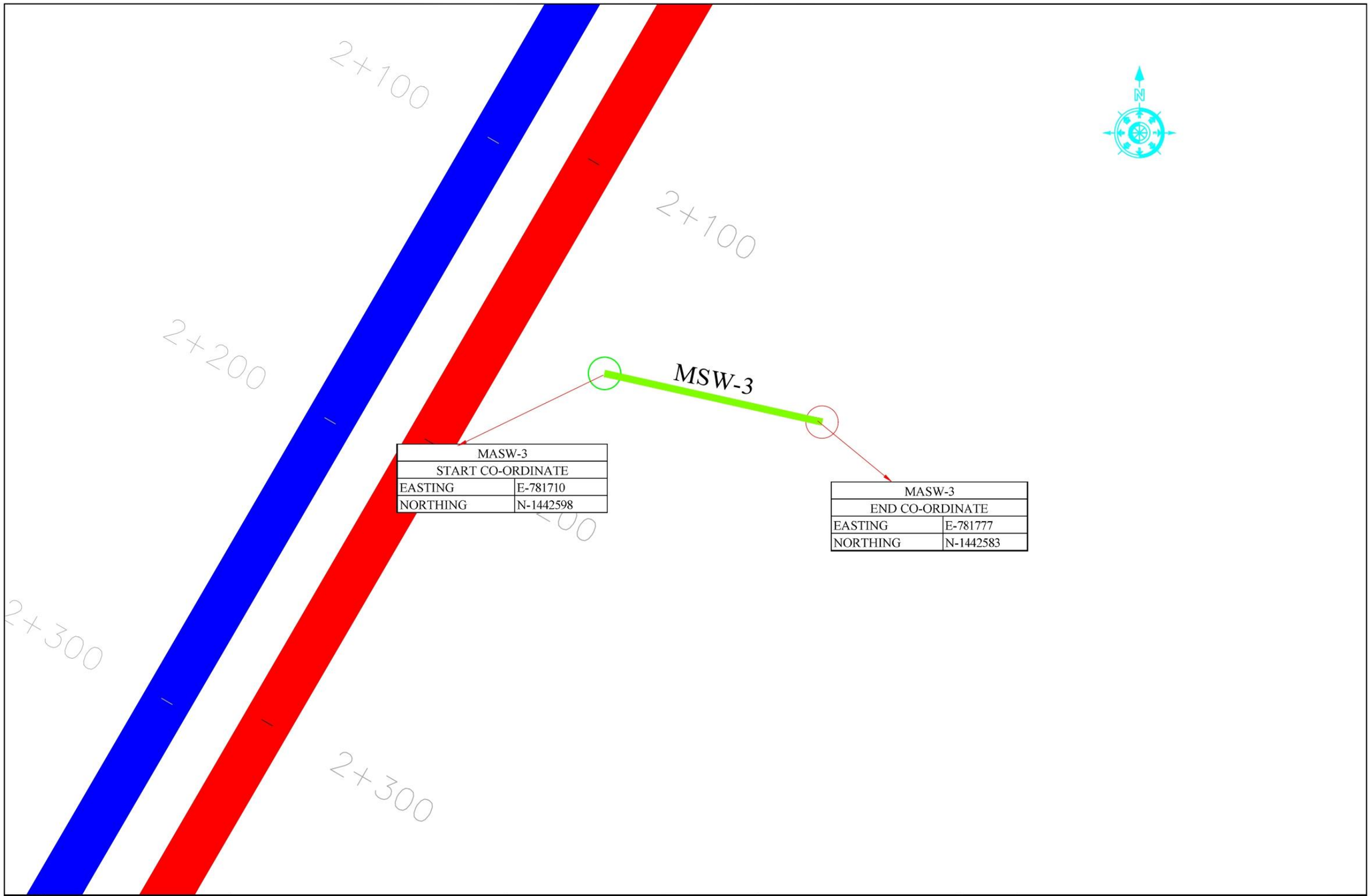
Project: "Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"

Drawing Title: GEOPHYSICAL SURVEY PLAN

Drawing No.: RC/1640/HO/HBT/TU/DWG/ 04



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EASTING	E-781710
NORTHING	N-1442598

MASW-3	
END CO-ORDINATE	
EASTING	E-781777
NORTHING	N-1442583

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Scale :- 1:1500
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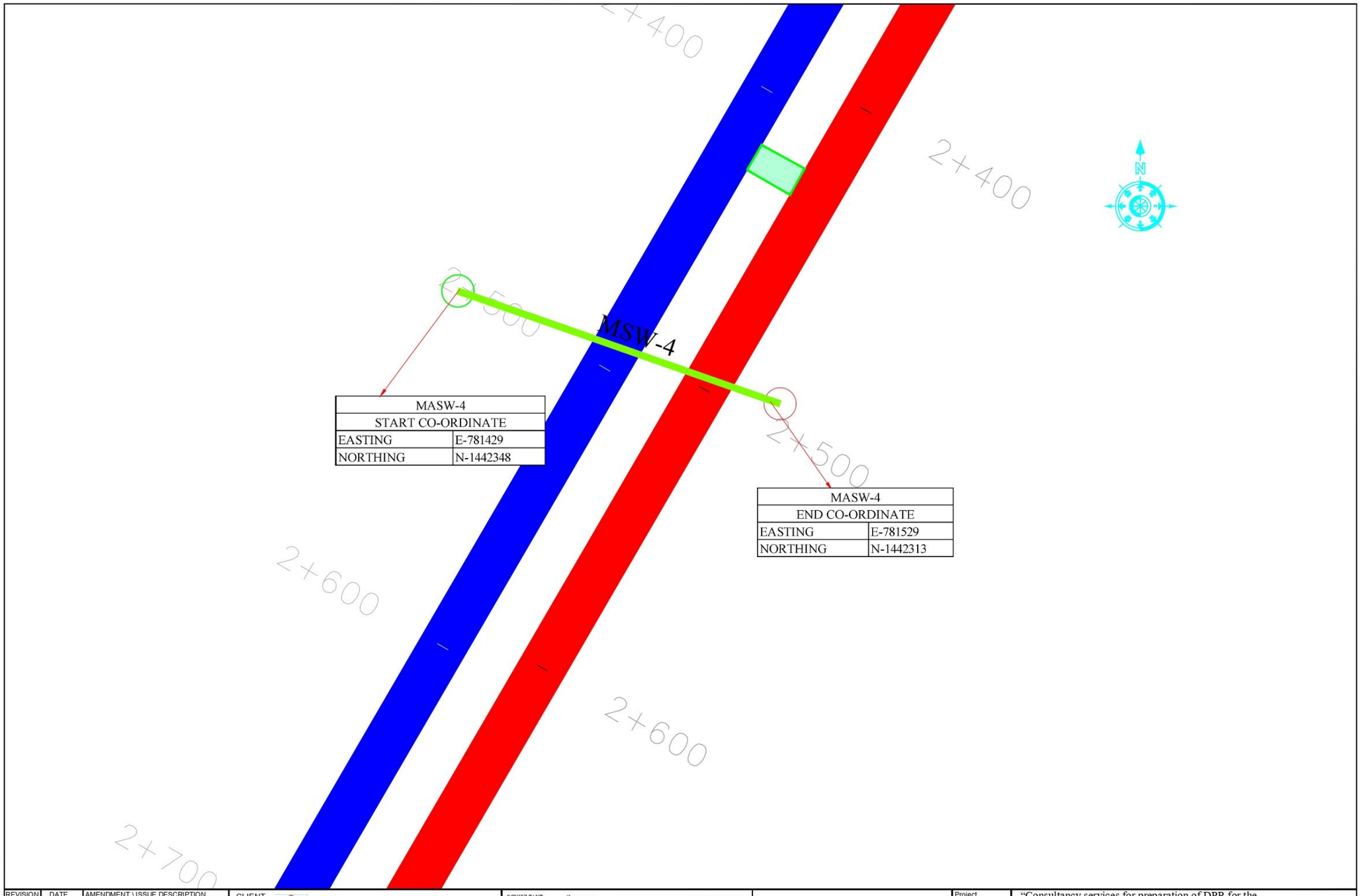
Project: "Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"

Drawing Title: GEOPHYSICAL SURVEY PLAN

Drawing No.: RC/1640/HO/HBT/TU/DWG/ 05



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EASTING	E-781429
NORTHING	N-1442348

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END CO-ORDINATE	
EASTING	E-781529
NORTHING	N-1442313

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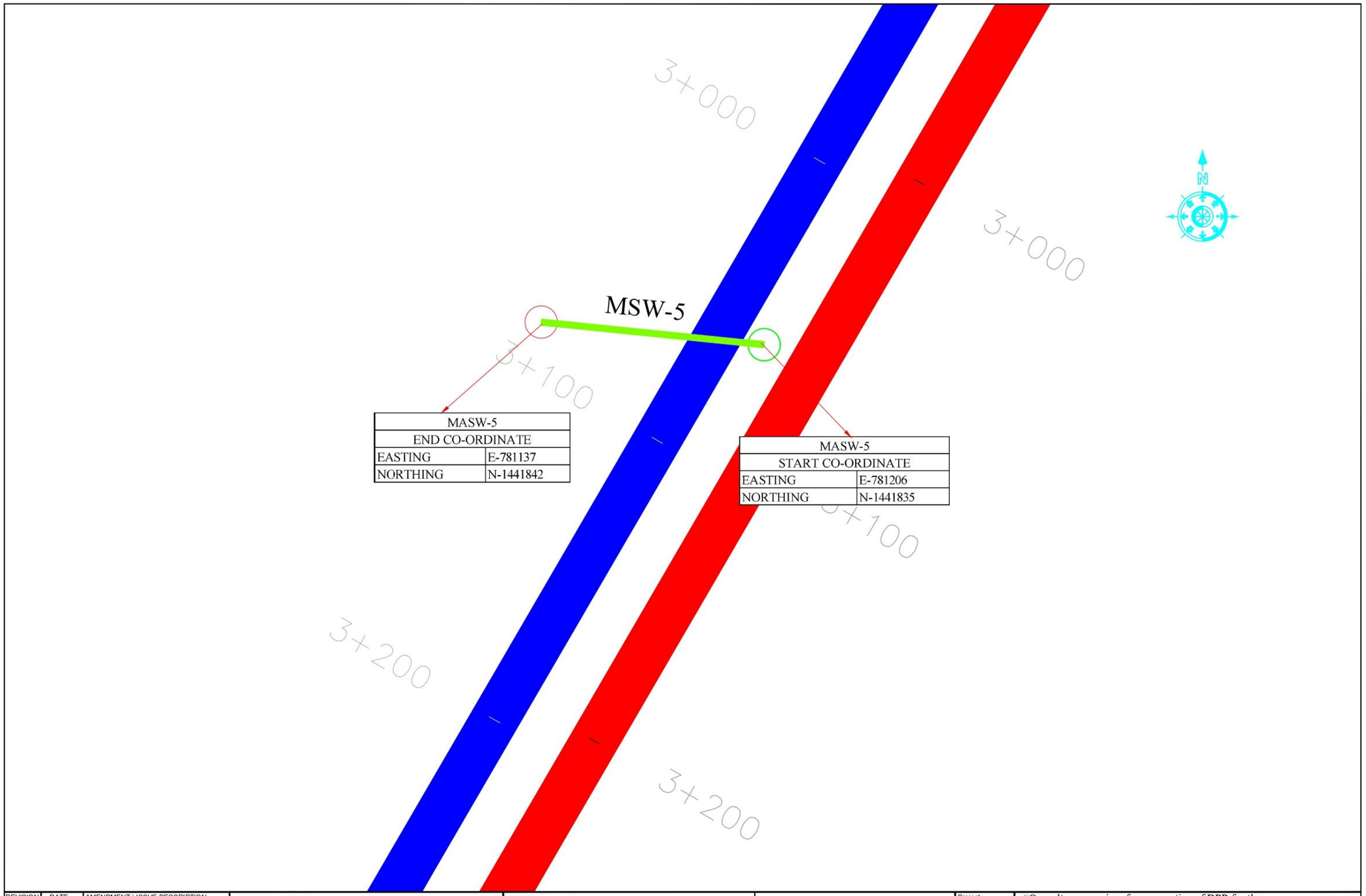
Checked:
Approved:
Scale :- 1:1500
Sheet size: A3

Project: "Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"
Drawing Title: GEOPHYSICAL SURVEY PLAN
Drawing No.: RC/1640/HO/HBT/TU/DWG/ 06



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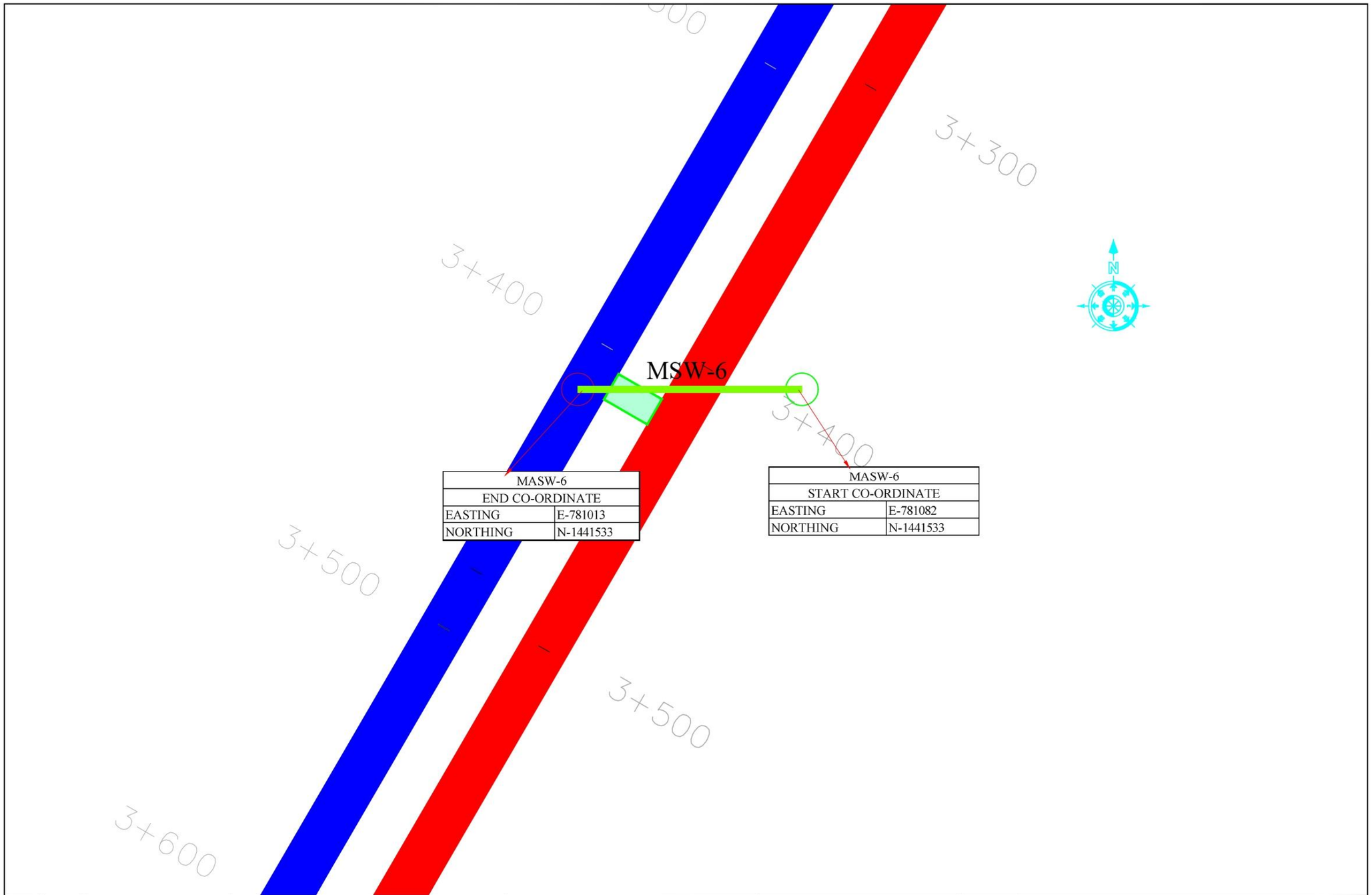
Project	"Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 07



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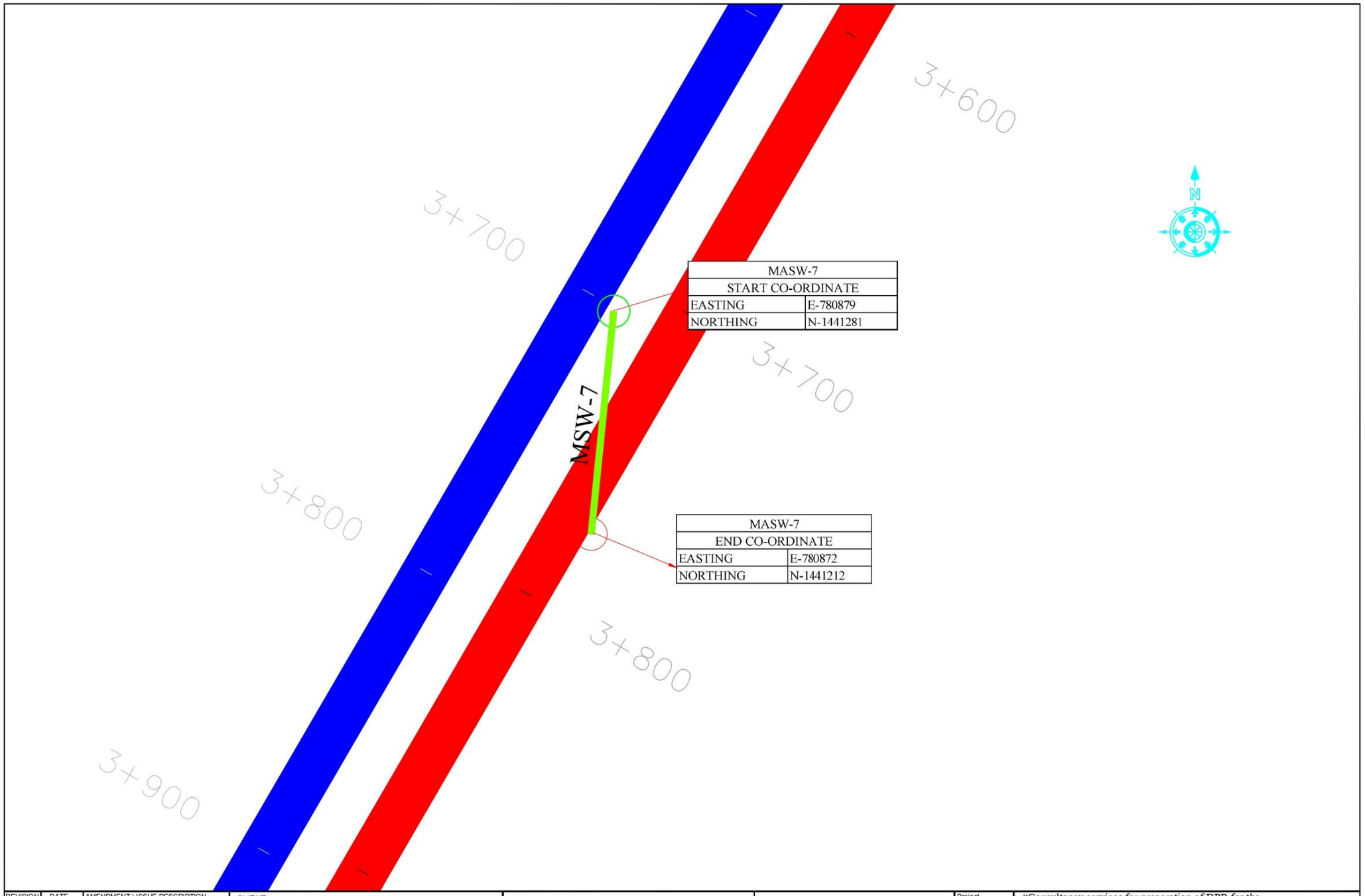
Project	"Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 08



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GEOPHYSICAL SURVEY REPORT

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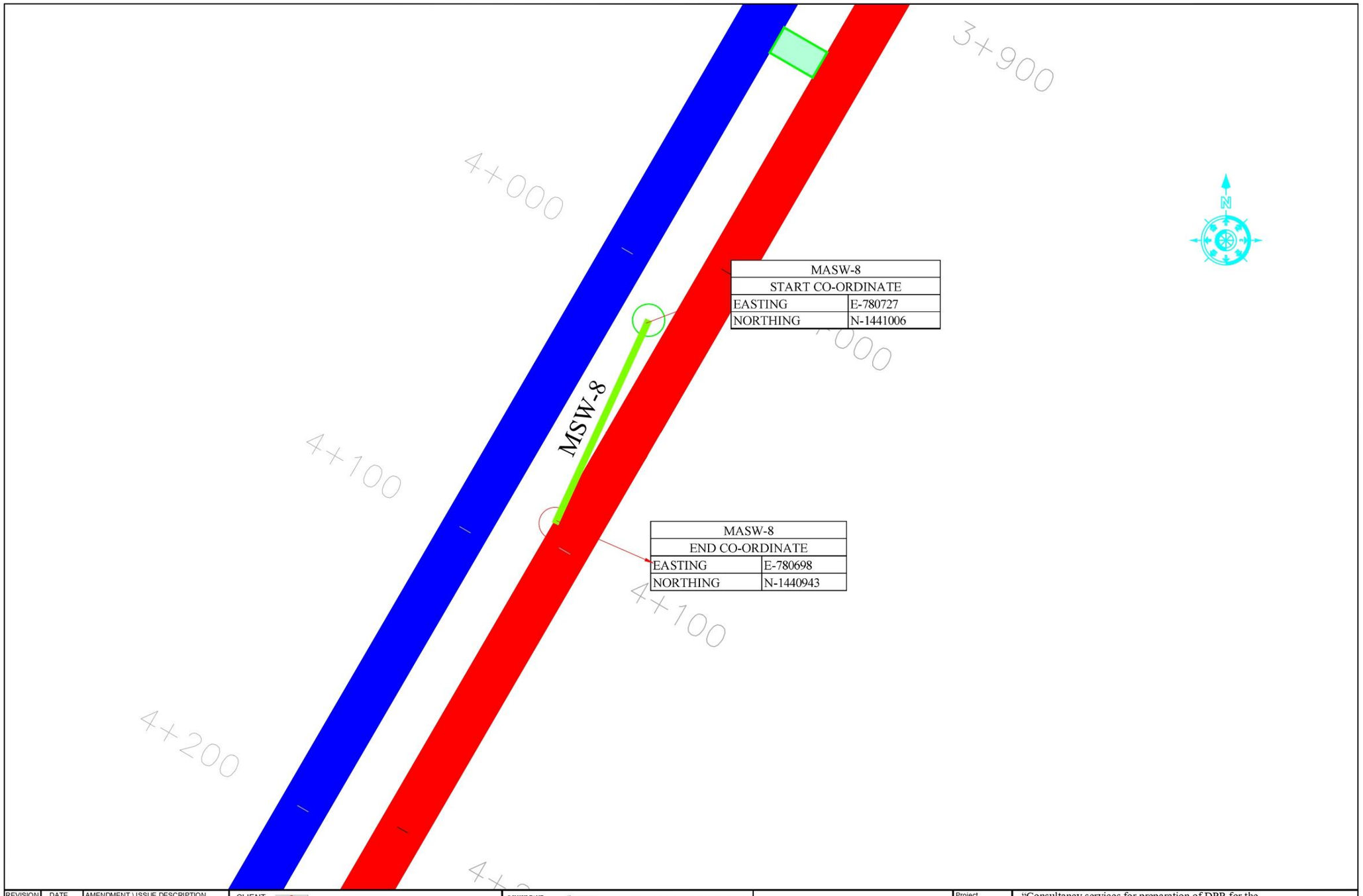
Project: "Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"
Drawing Title: GEOPHYSICAL SURVEY PLAN
Drawing No.: RC/1640/HO/HBT/TU/DWG/ 09



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EASTING	E-780727
NORTHING	N-1441006

MASW-8	
END CO-ORDINATE	
EASTING	E-780698
NORTHING	N-1440943

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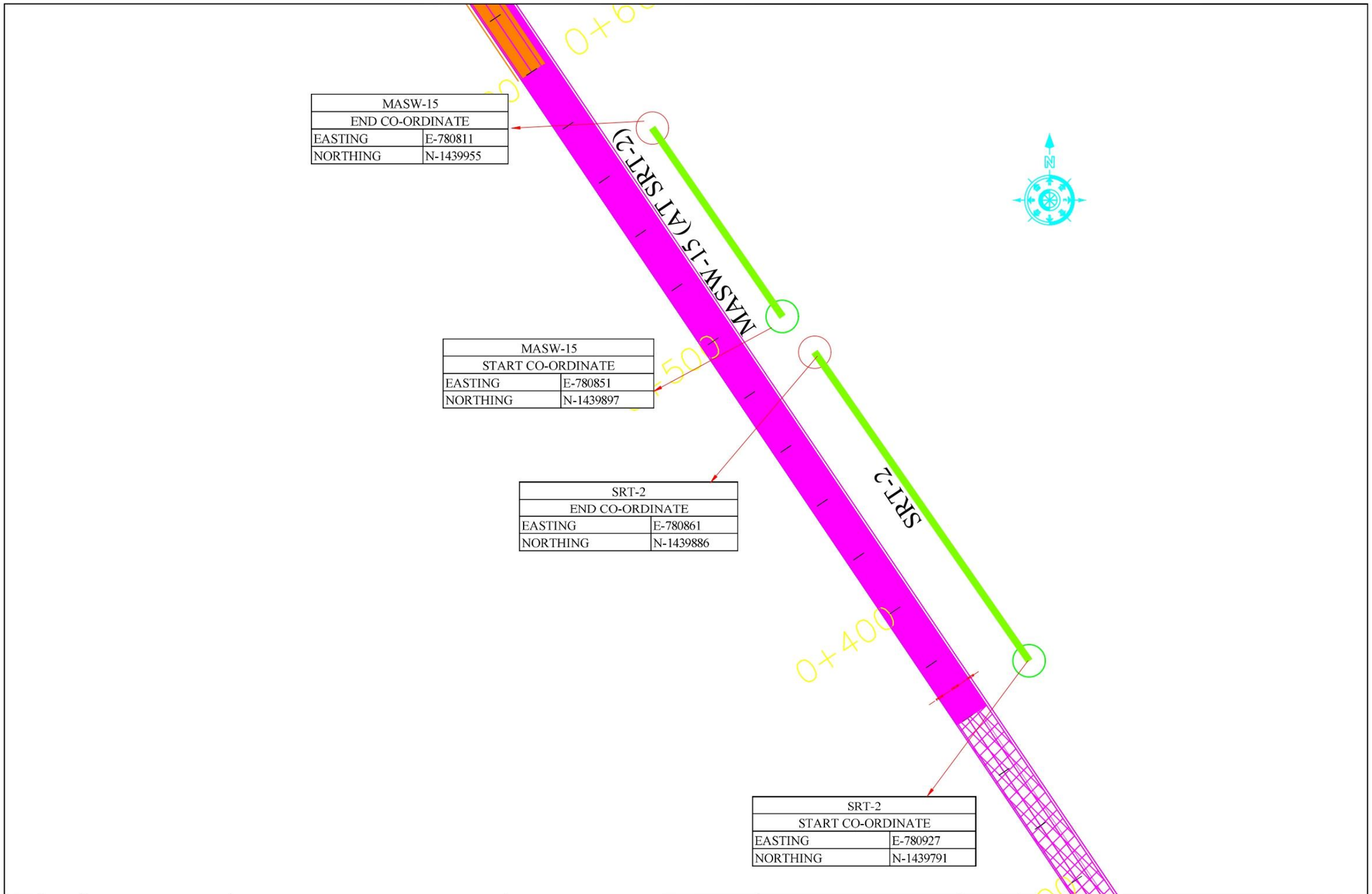
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 10



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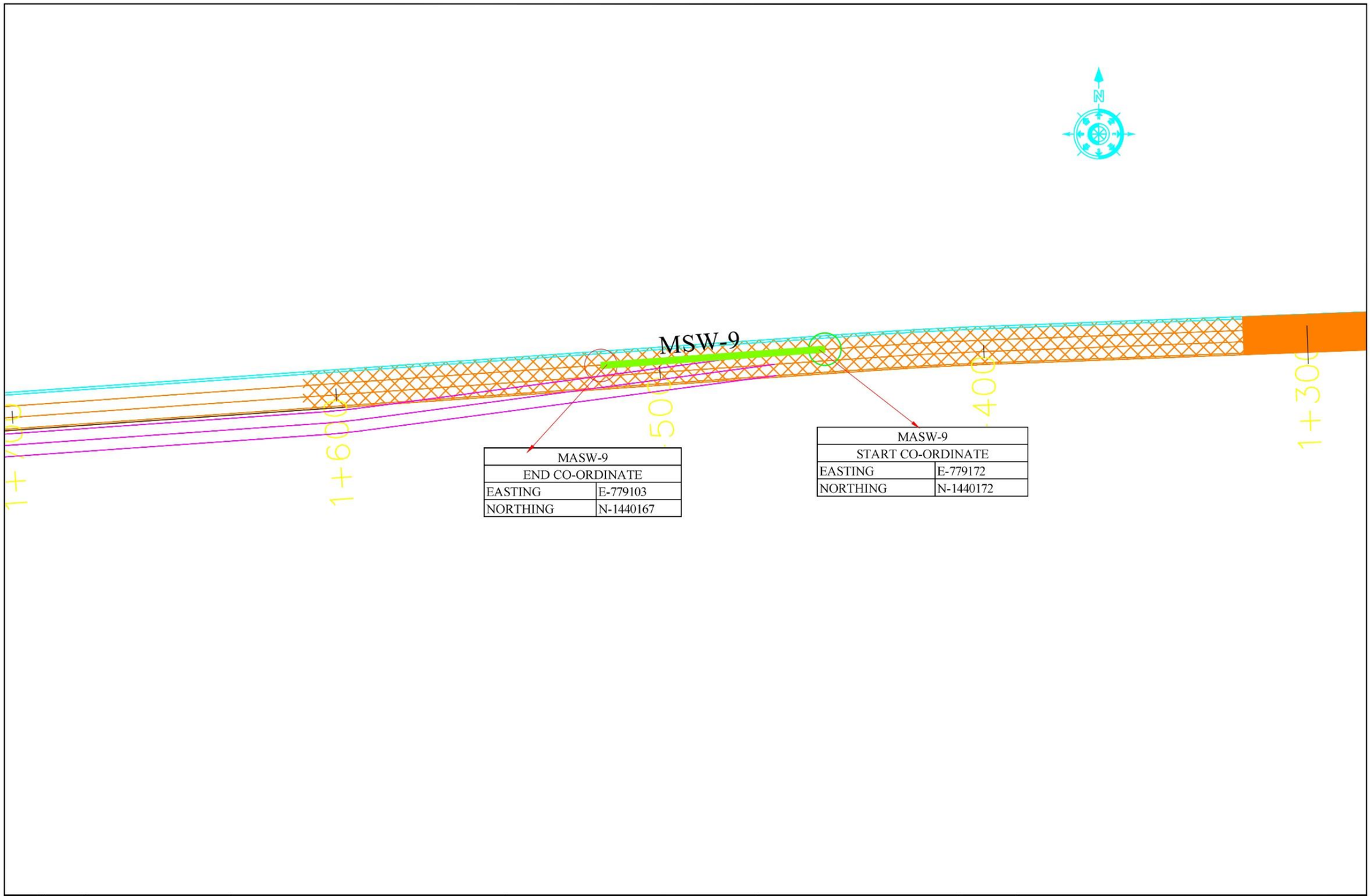
Project: "Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"

Drawing Title: GEOPHYSICAL SURVEY PLAN

Drawing No.: RC/1640/HO/HBT/TU/DWG/ 11



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END CO-ORDINATE	
EASTING	E-779103
NORTHING	N-1440167

MASW-9	
START CO-ORDINATE	
EASTING	E-779172
NORTHING	N-1440172

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GEOPHYSICAL SURVEY REPORT

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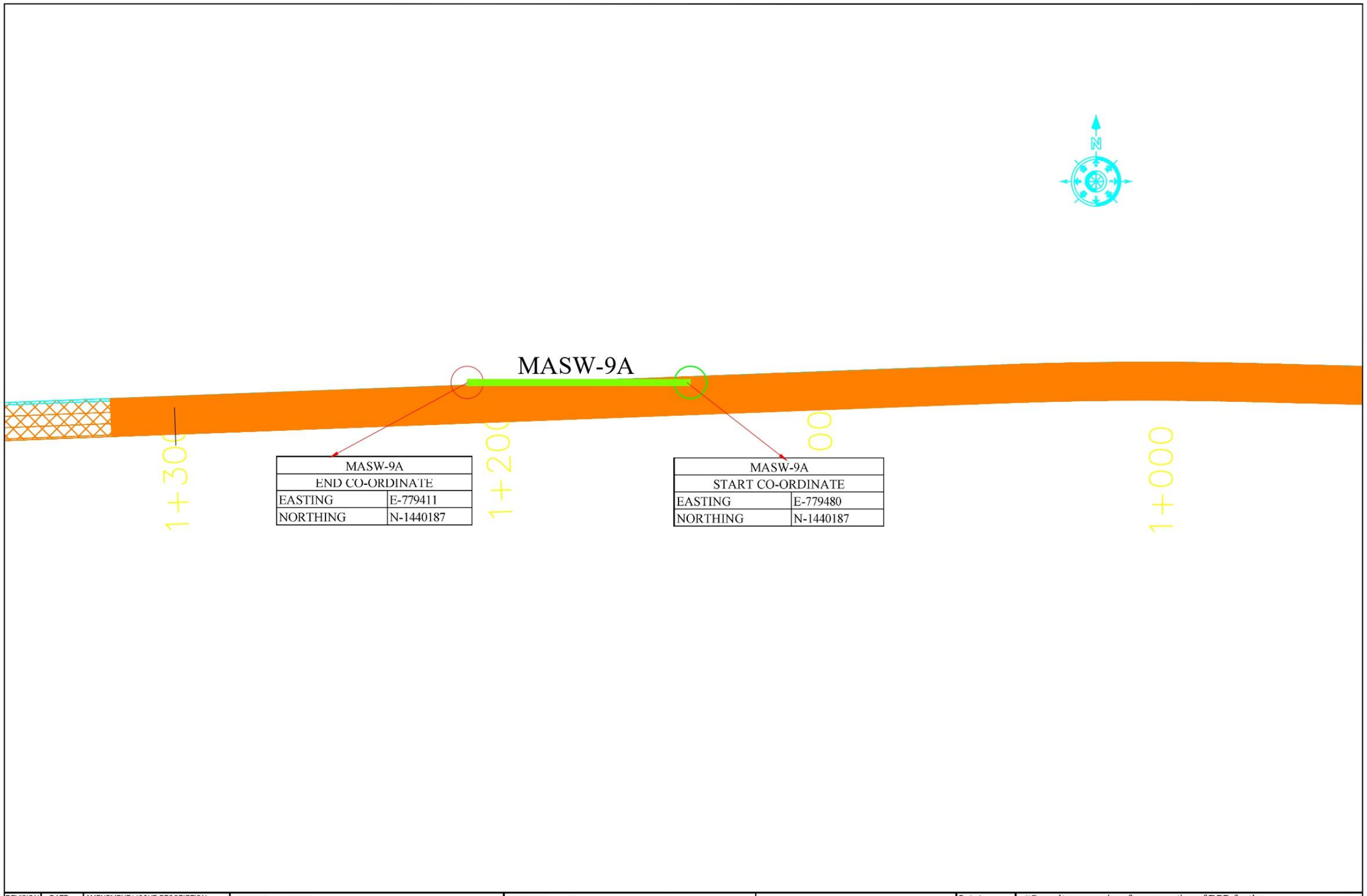
Project: "Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"
Drawing Title: GEOPHYSICAL SURVEY PLAN
Drawing No.: RC/1640/HO/HBT/TU/DWG/ 12



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GEOPHYSICAL SURVEY REPORT

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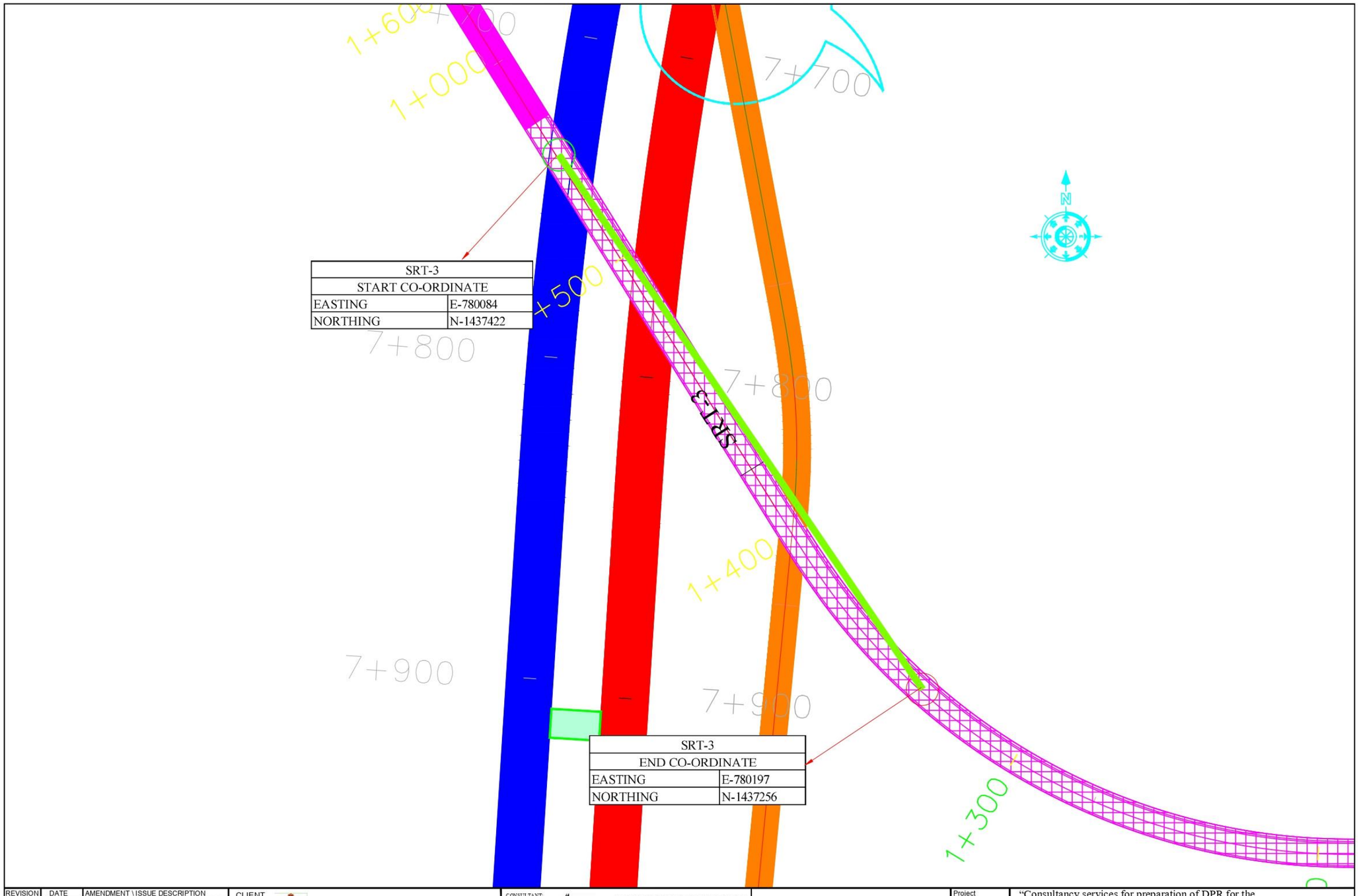
Project	"Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 13



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GEOPHYSICAL SURVEY REPORT

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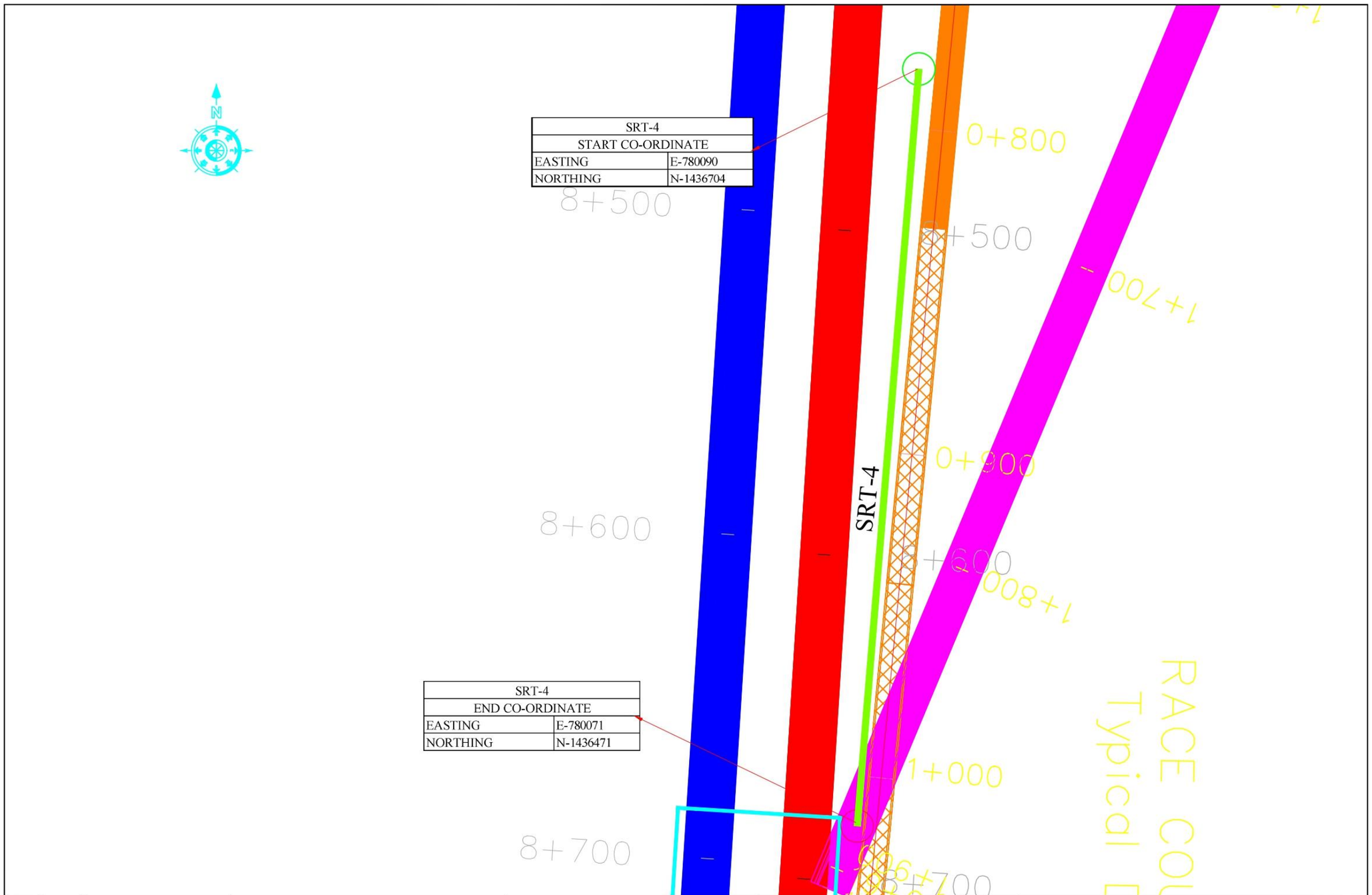
Project: "Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"

Drawing Title: GEOPHYSICAL SURVEY PLAN

Drawing No.: RC/1640/HO/HBT/TU/DWG/ 14



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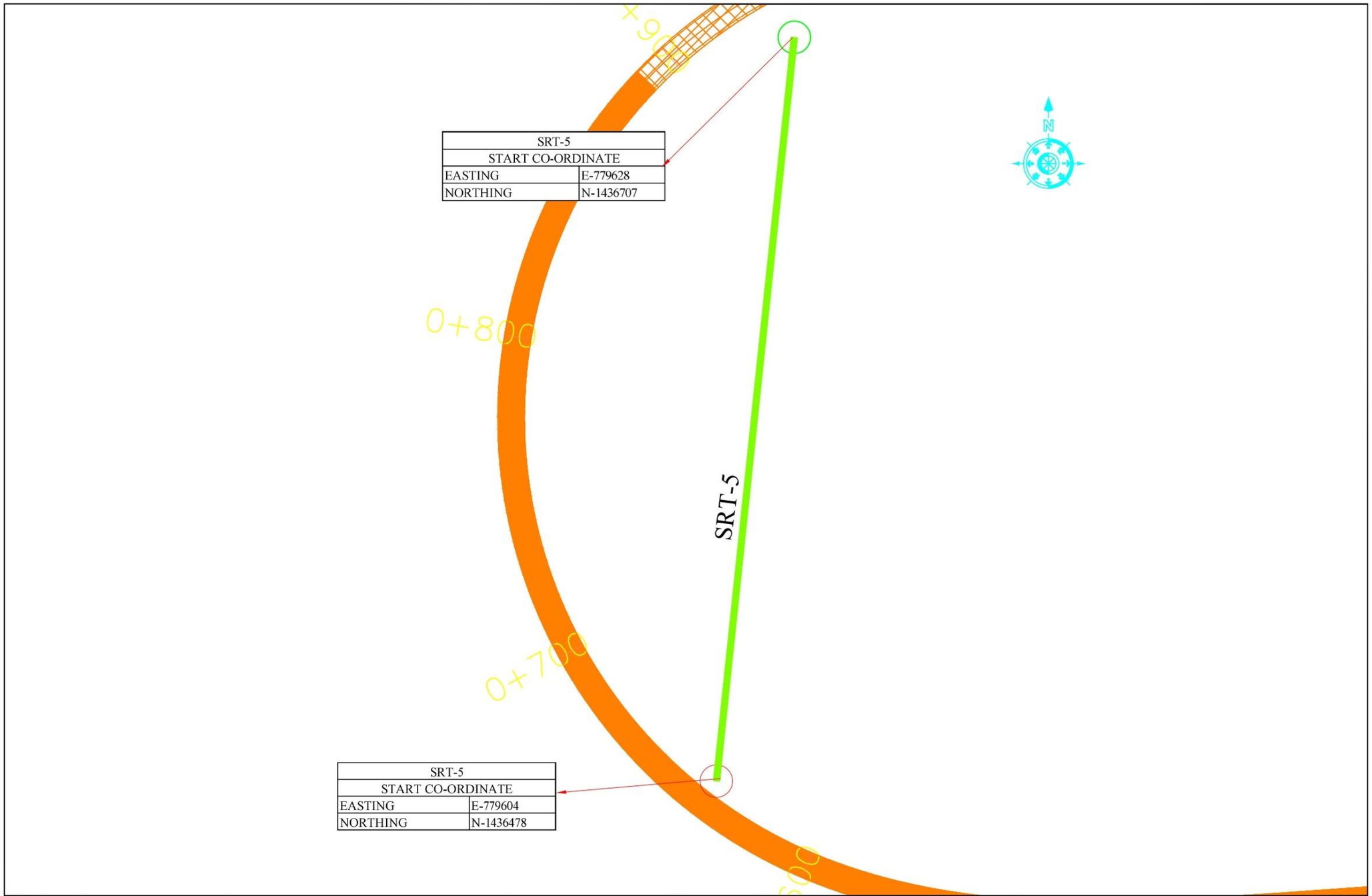
Project	"Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 15



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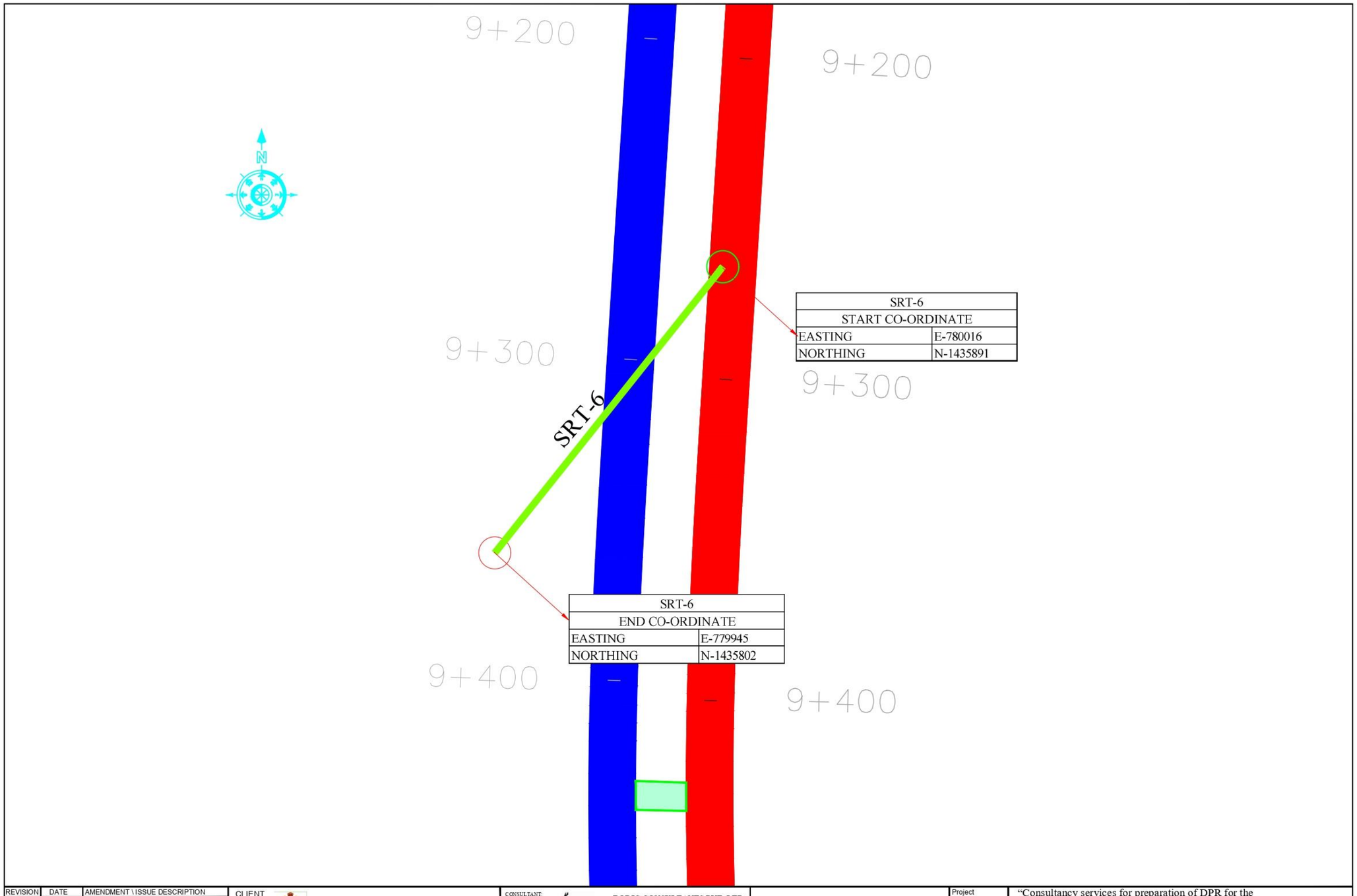
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 16



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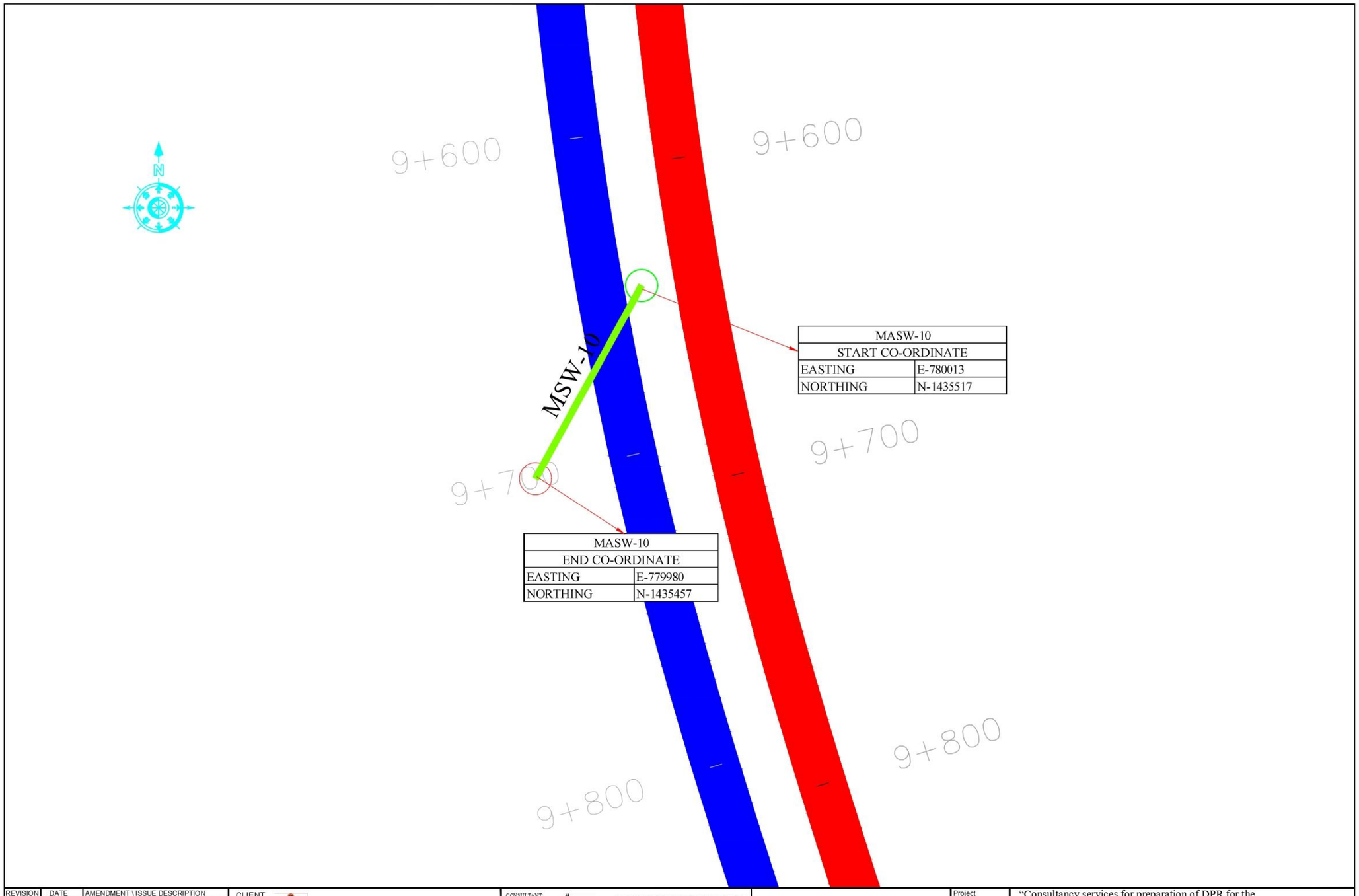
Drawing Title: GEOPHYSICAL SURVEY PLAN

Drawing No.: RC/1640/HO/HBT/TU/DWG/ 17



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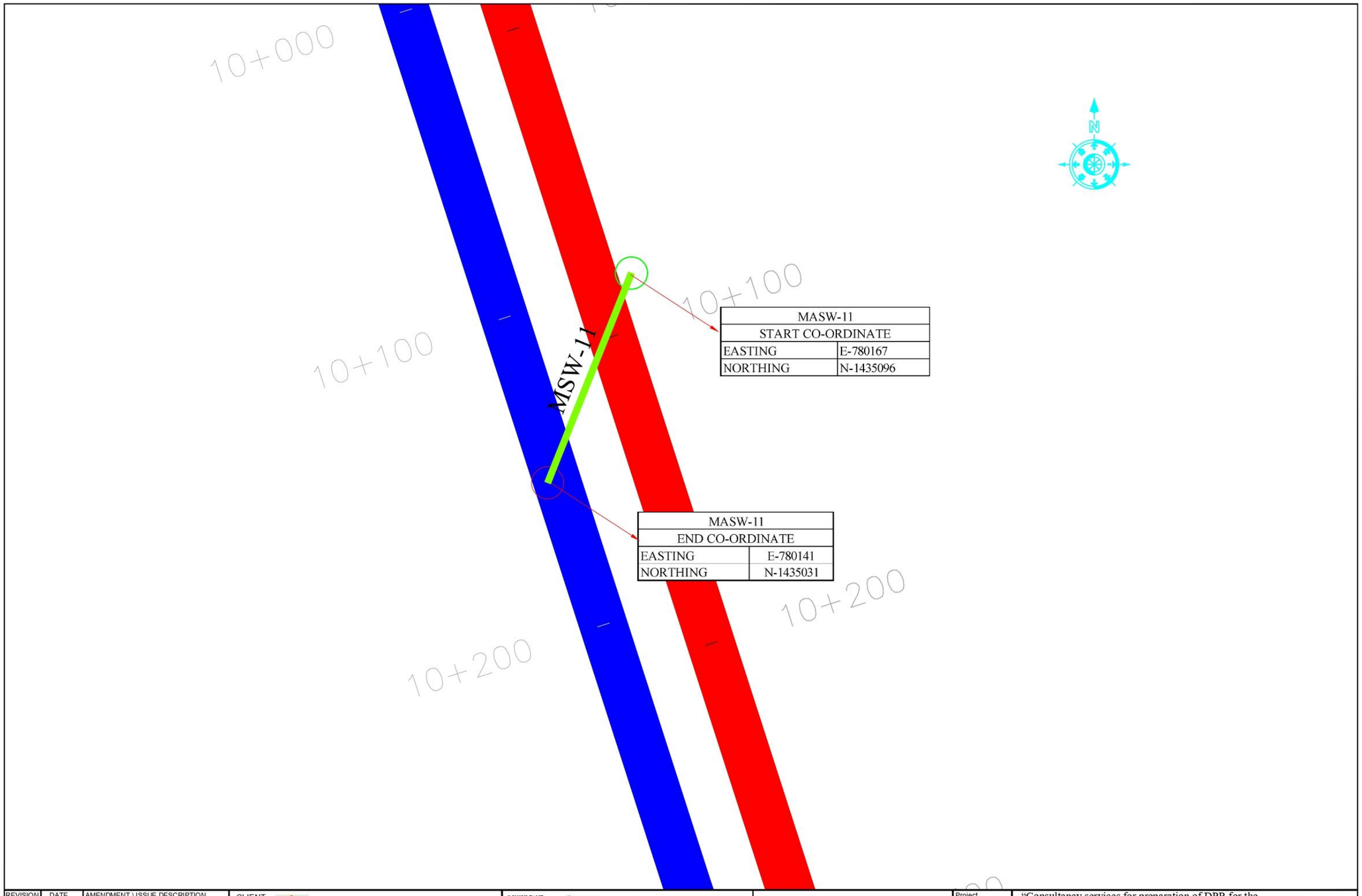
Drawing Title: GEOPHYSICAL SURVEY PLAN
Drawing No.: RC/1640/HO/HBT/TU/DWG/ 18



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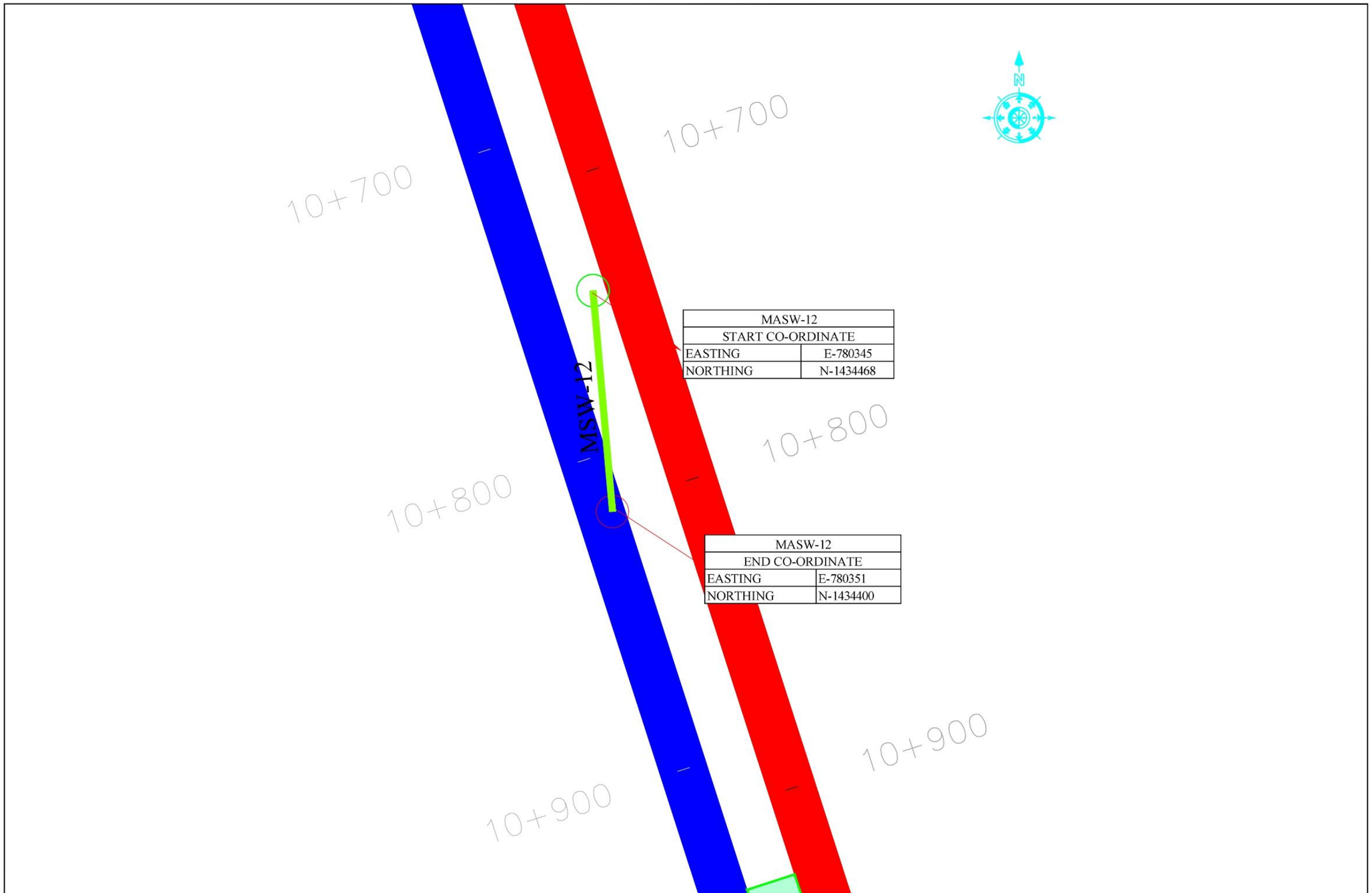
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 19



MASW-12	
START CO-ORDINATE	
EASTING	E-780345
NORTHING	N-1434468

MASW-12	
END CO-ORDINATE	
EASTING	E-780351
NORTHING	N-1434400

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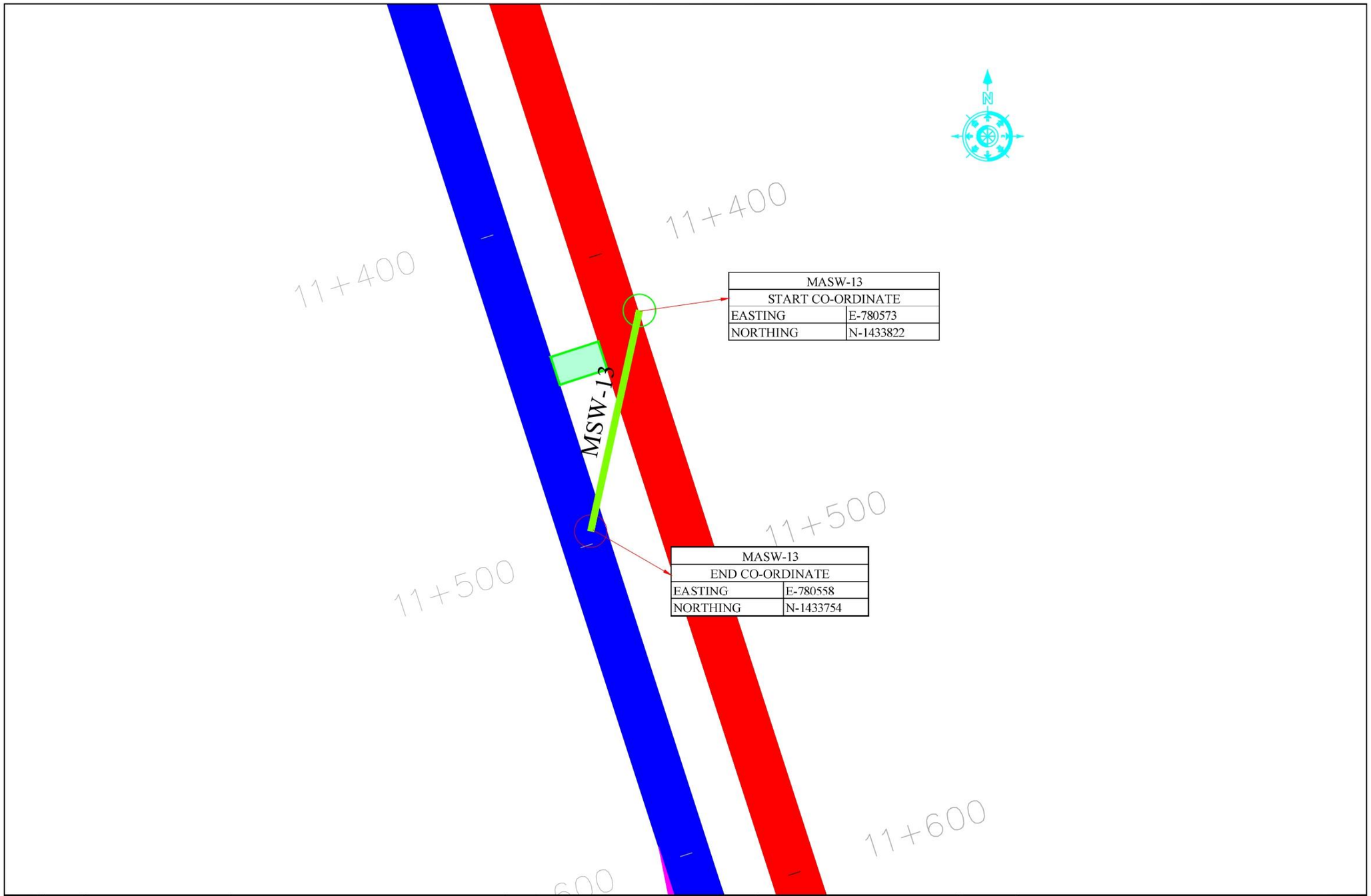
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 20



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GOVERNMENT OF KARANATAKA
Bruhat Bangalore Mahanagara Palike

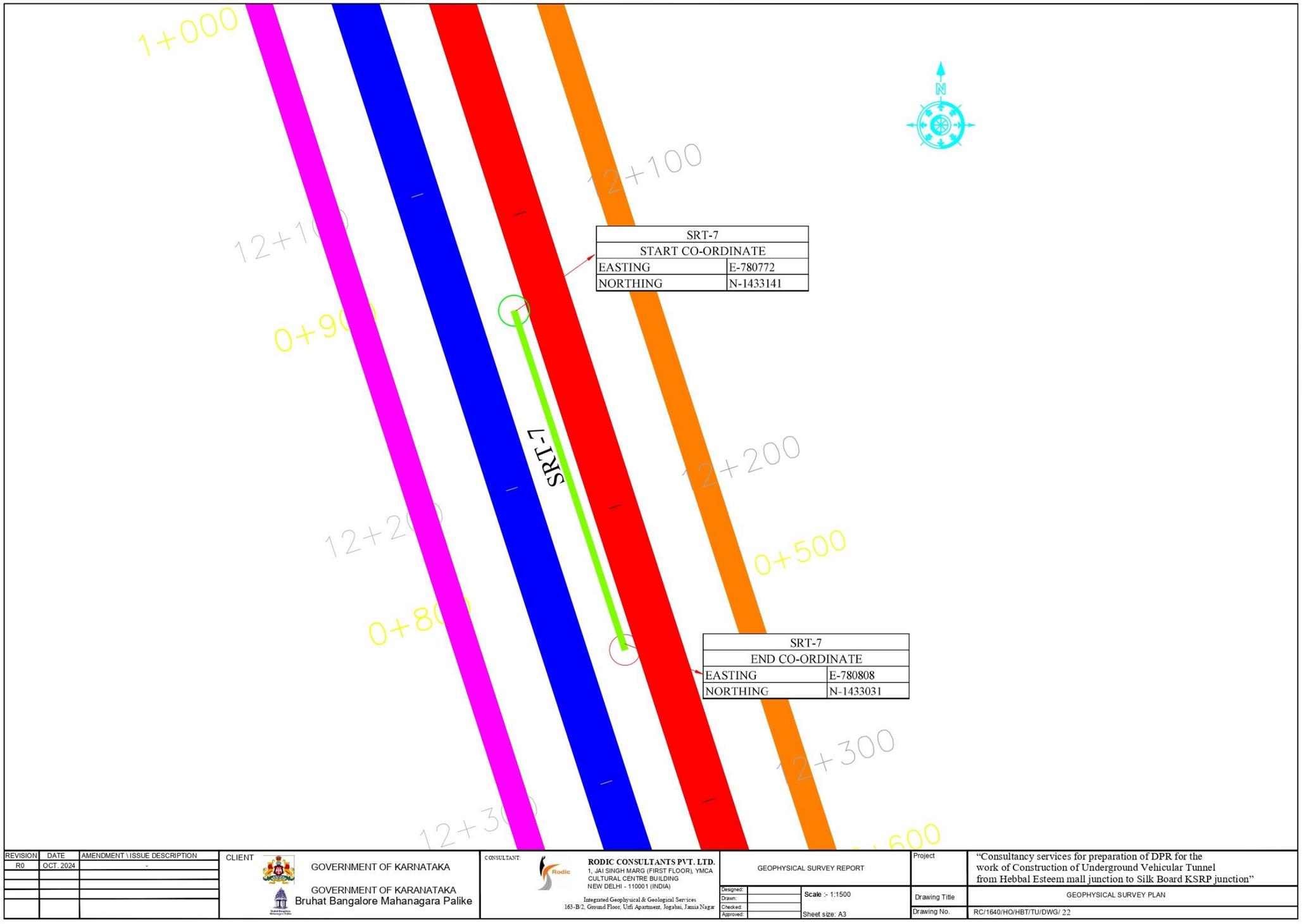
CONSULTANT: **RODIC CONSULTANTS PVT. LTD.**
1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING
NEW DELHI - 110001 (INDIA)
Integrated Geophysical & Geological Services
163-B/2, Ground Floor, Urfi Apartment, Jogabai, Jamia Nagar

GEOPHYSICAL SURVEY REPORT

Designed: | Drawn: | Checked: | Approved:

Scale :- 1:1500
Sheet size: A3

Project	"Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 21



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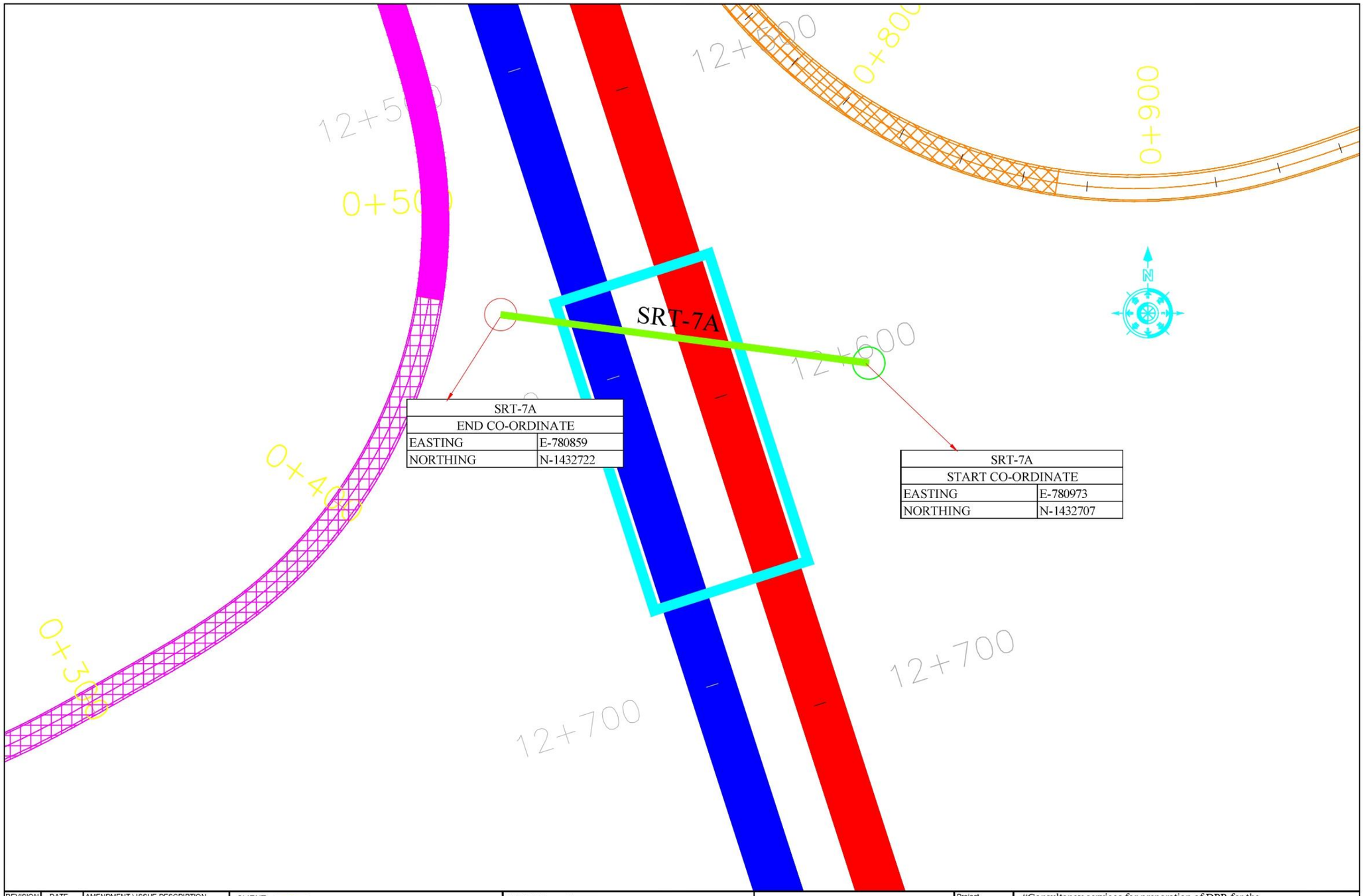
Drawing Title: GEOPHYSICAL SURVEY PLAN
Drawing No.: RC/1640/HO/HBT/TU/DWG/ 22



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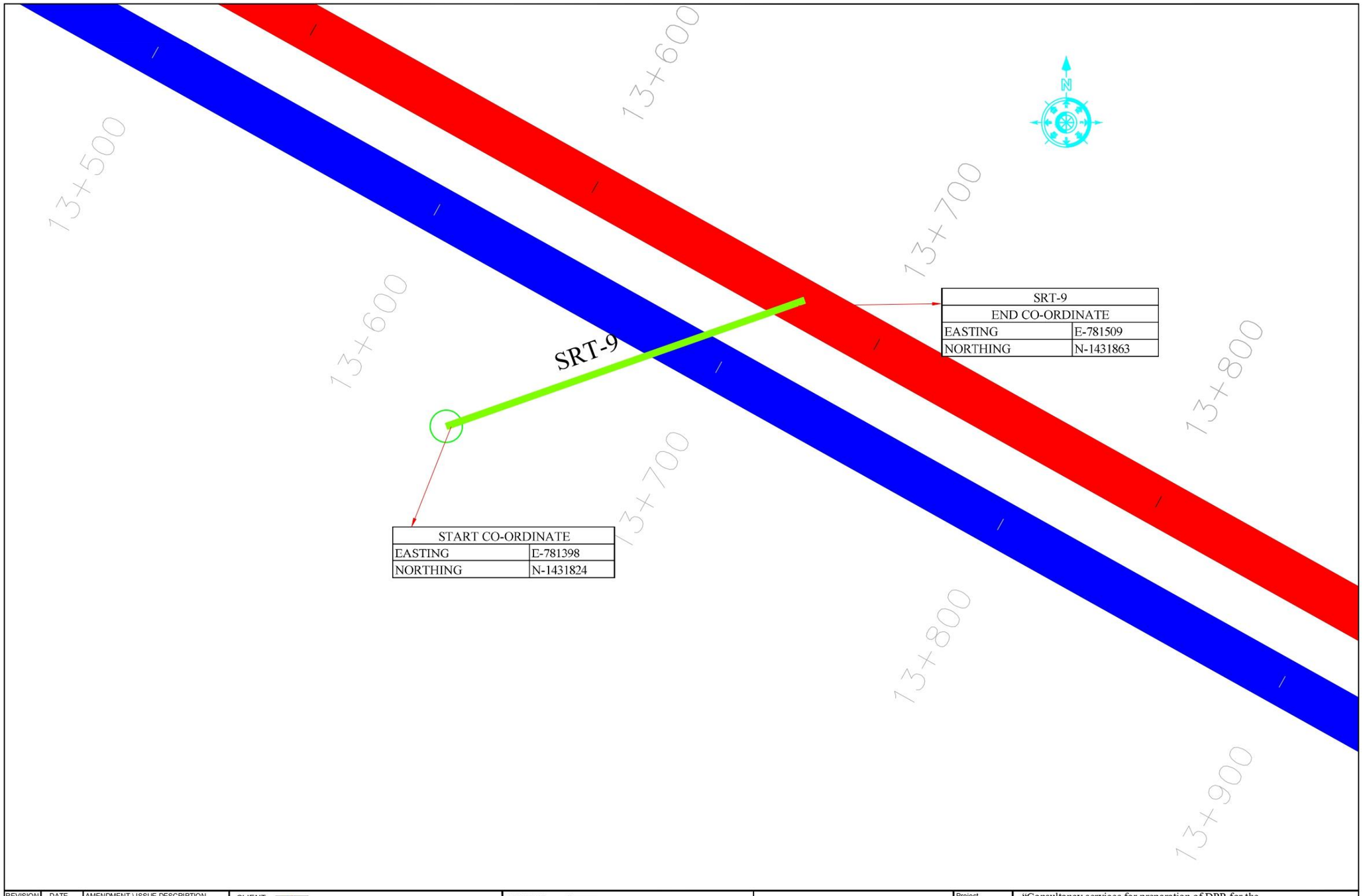
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 23



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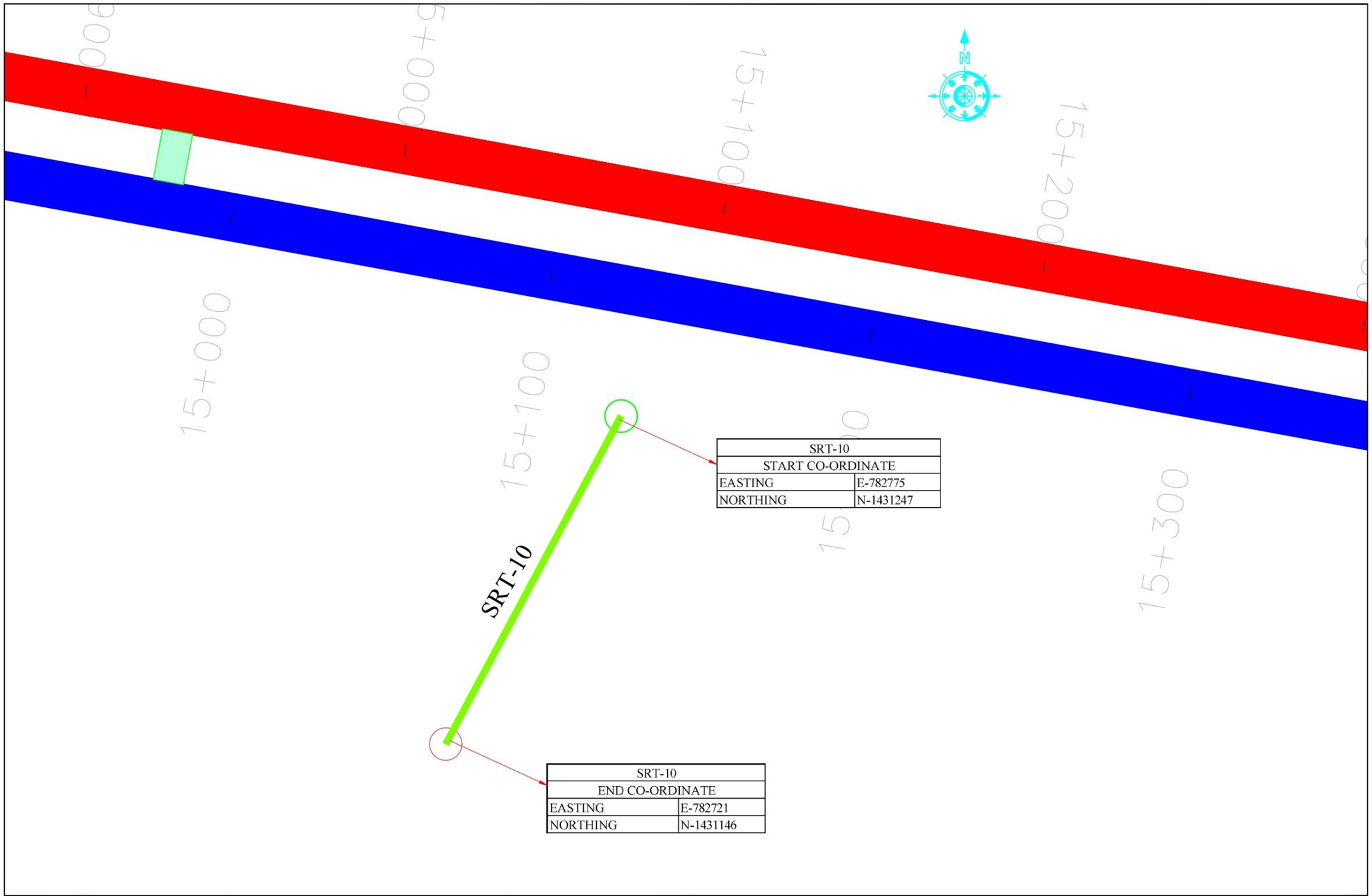
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 24



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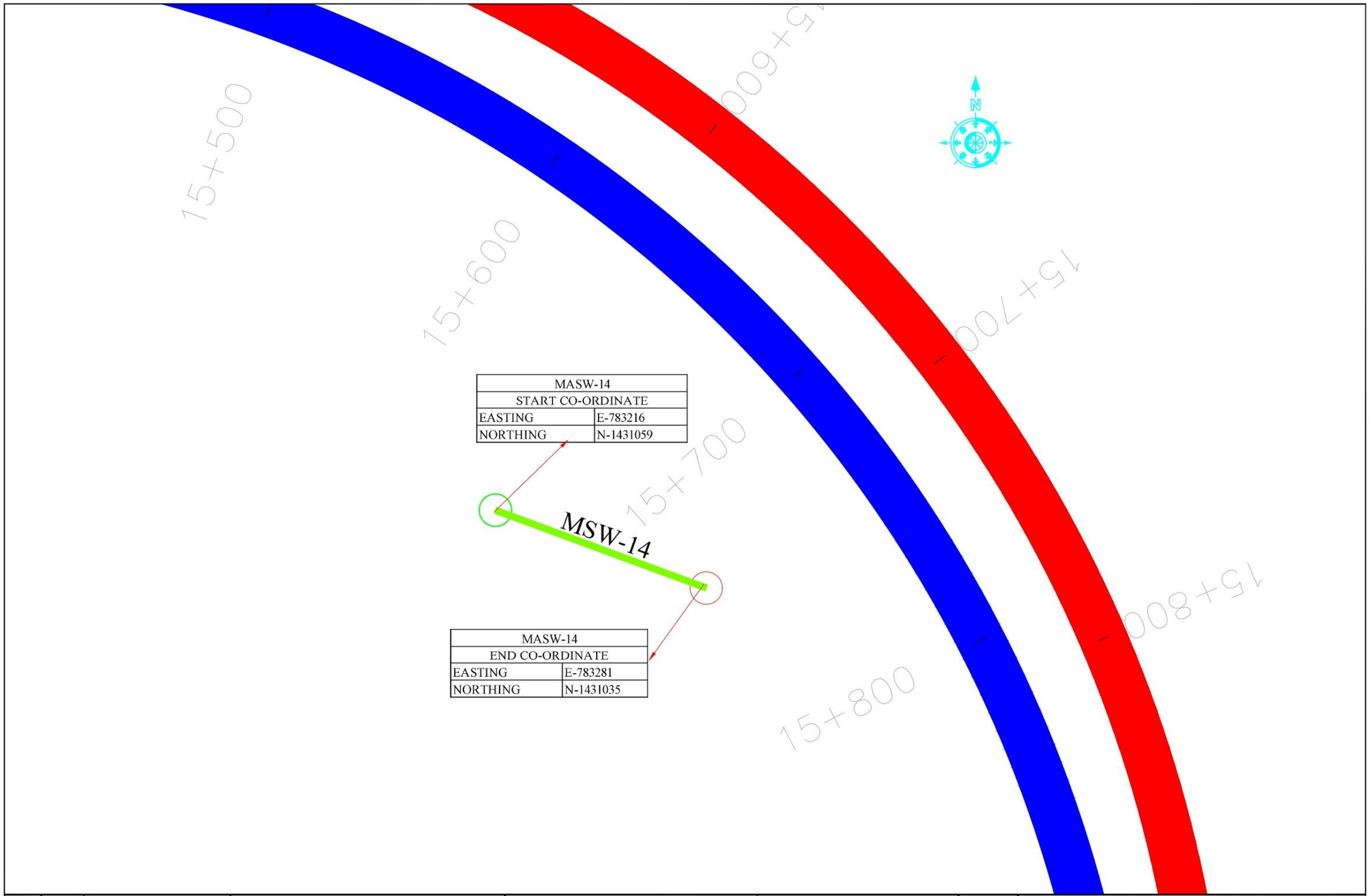
Drawing Title: GEOPHYSICAL SURVEY PLAN

Drawing No.: RC/1640/HO/HBT/TU/DWG/ 25



MASW-14	
START CO-ORDINATE	
EASTING	E-783216
NORTHING	N-1431059

MASW-14	
END CO-ORDINATE	
EASTING	E-783281
NORTHING	N-1431035

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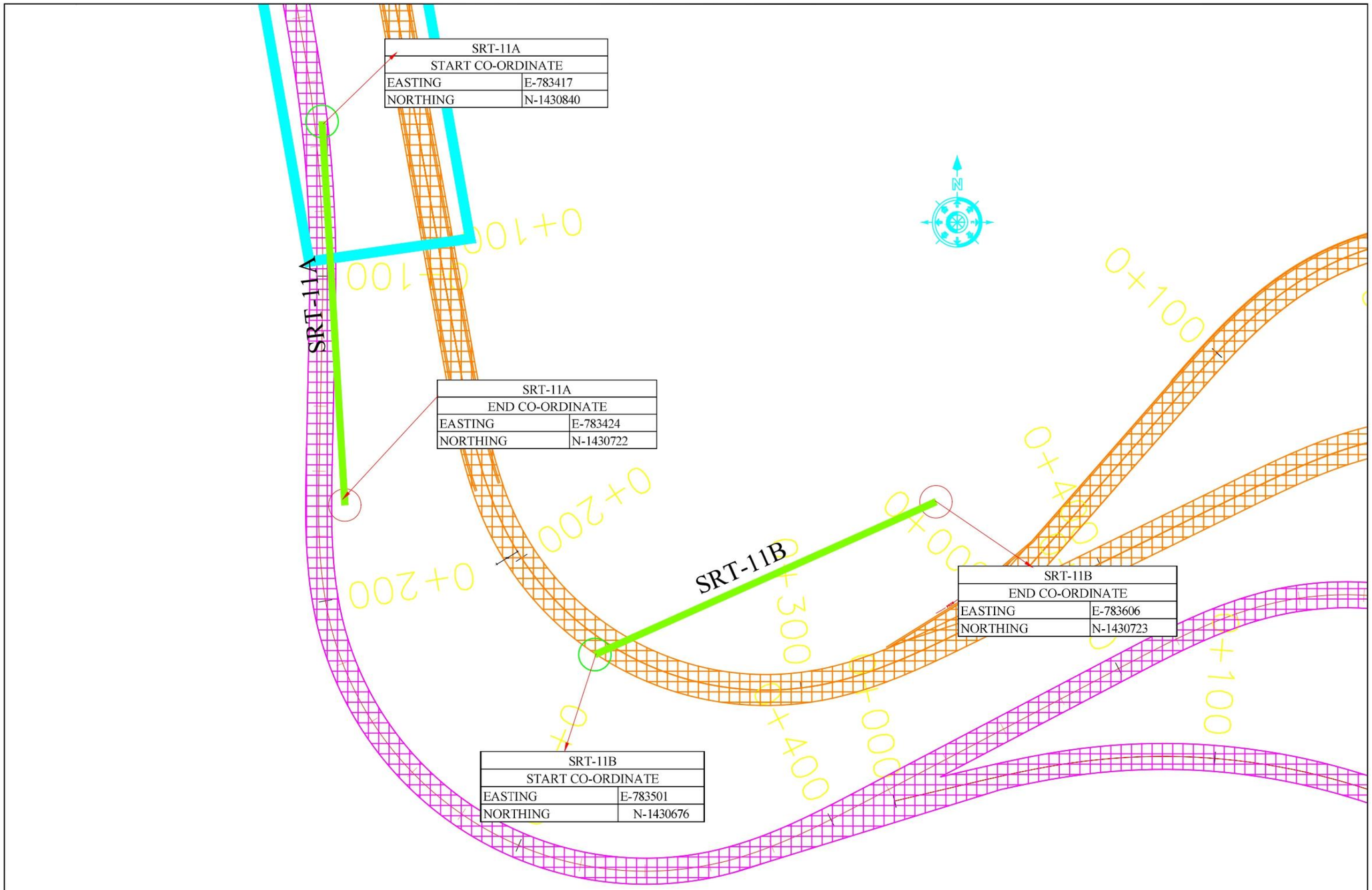
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 26



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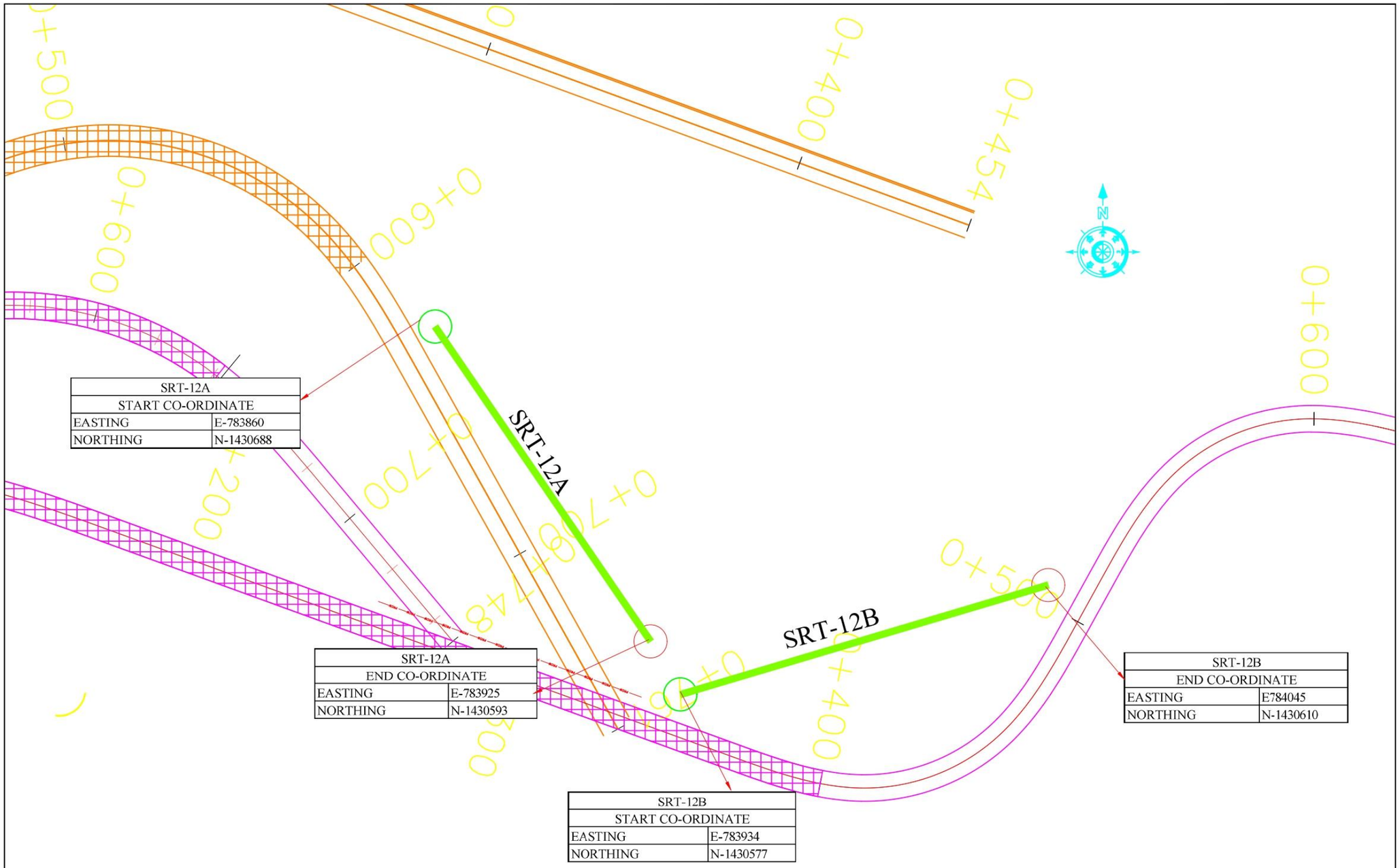
Drawing Title	GEOPHYSICAL SURVEY PLAN
Drawing No.	RC/1640/HO/HBT/TU/DWG/ 27



SRT-12A	
START CO-ORDINATE	
EASTING	E-783860
NORTHING	N-1430688

SRT-12A	
END CO-ORDINATE	
EASTING	E-783925
NORTHING	N-1430593

SRT-12B	
START CO-ORDINATE	
EASTING	E-783934
NORTHING	N-1430577

SRT-12B	
END CO-ORDINATE	
EASTING	E784045
NORTHING	N-1430610

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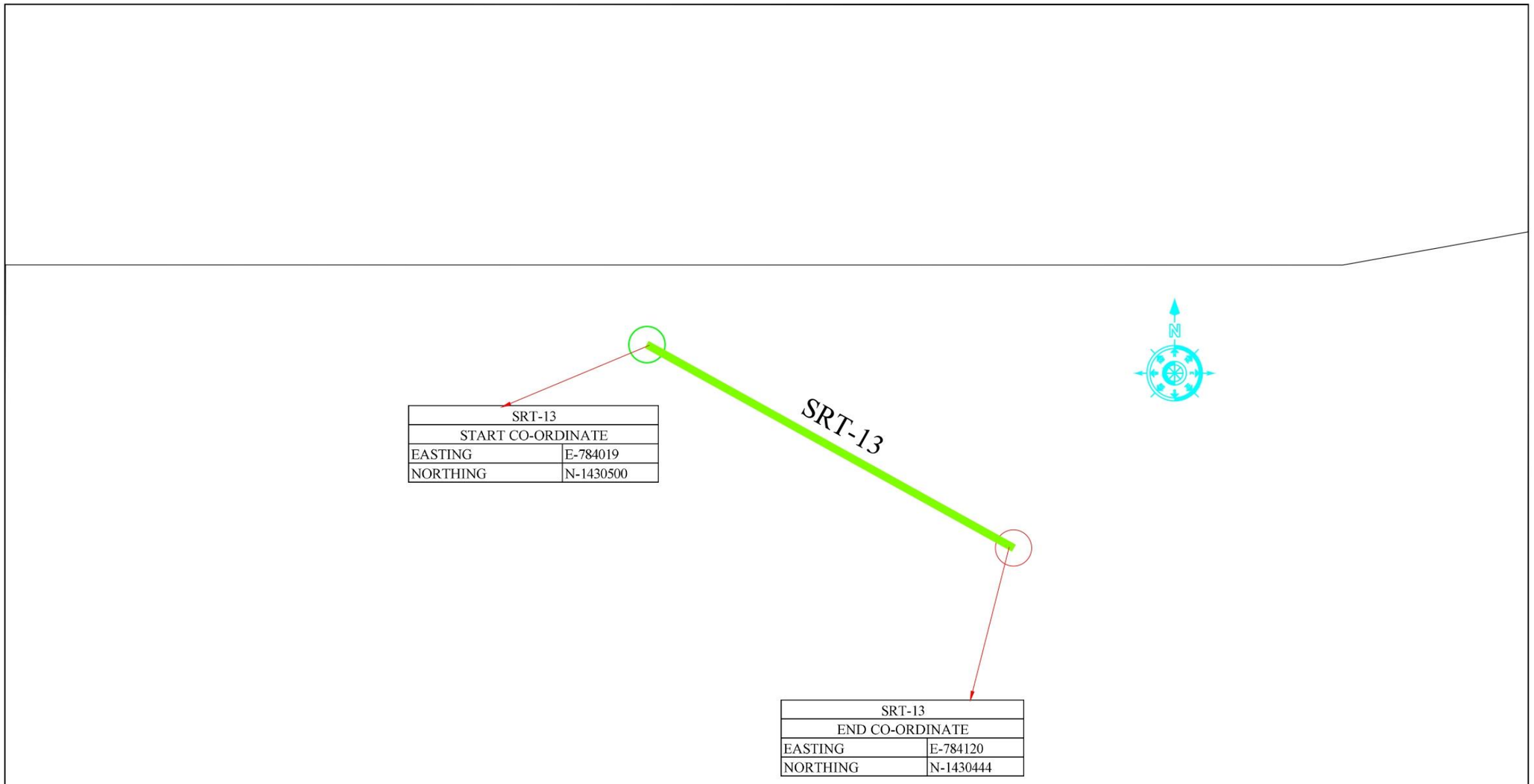
Drawing Title: GEOPHYSICAL SURVEY PLAN

Drawing No.: RC/1640/HO/HBT/TU/DWG/ 28



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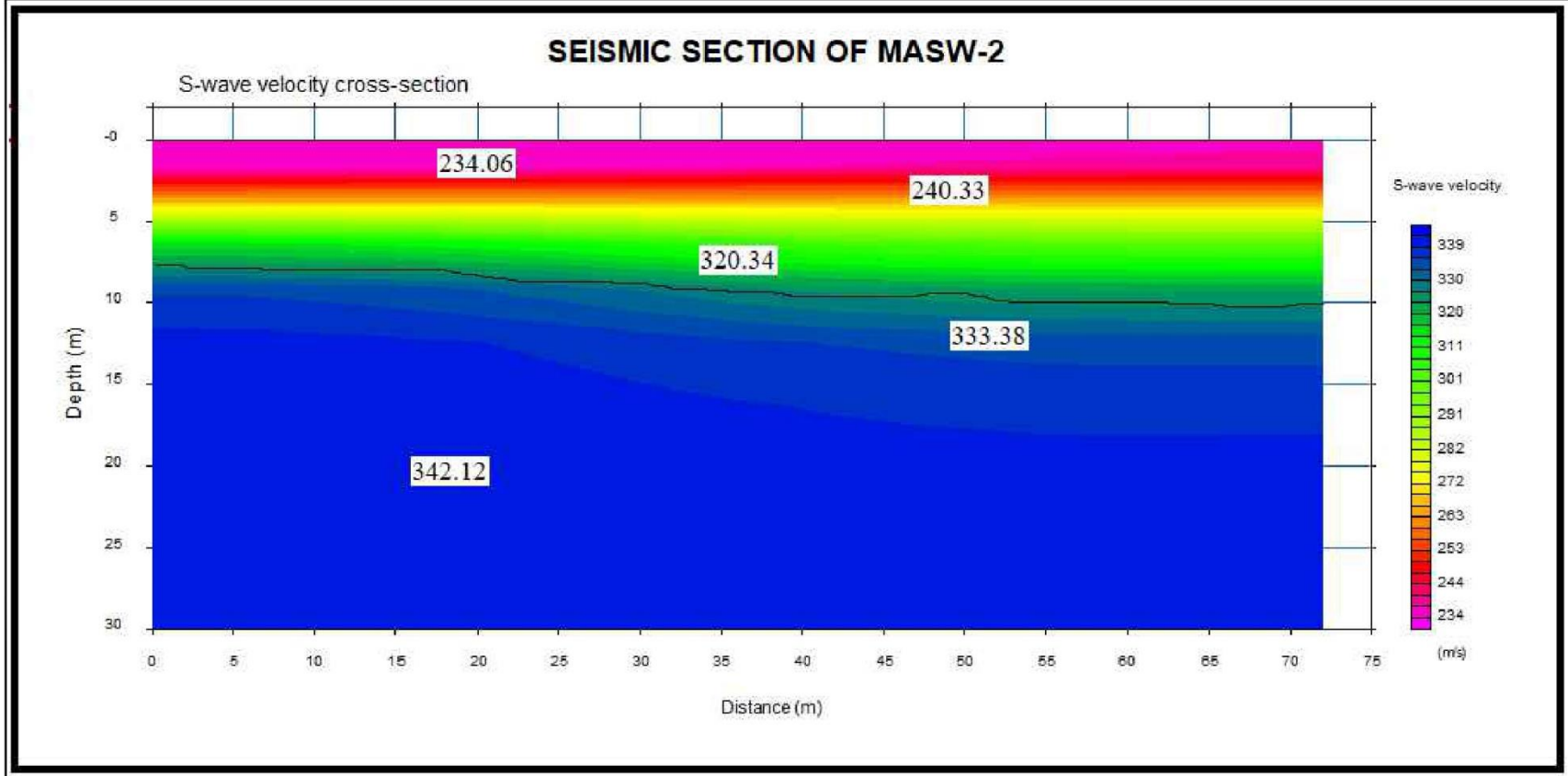
Project: "Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"

Drawing Title: GEOPHYSICAL SURVEY PLAN

Drawing No.: RC/1640/HO/HBT/TU/DWG/ 29

ANNEXURE - 2 - INTERPRETED SECTIONS OF SEISMIC REFRACTION AND MASW SURVEY



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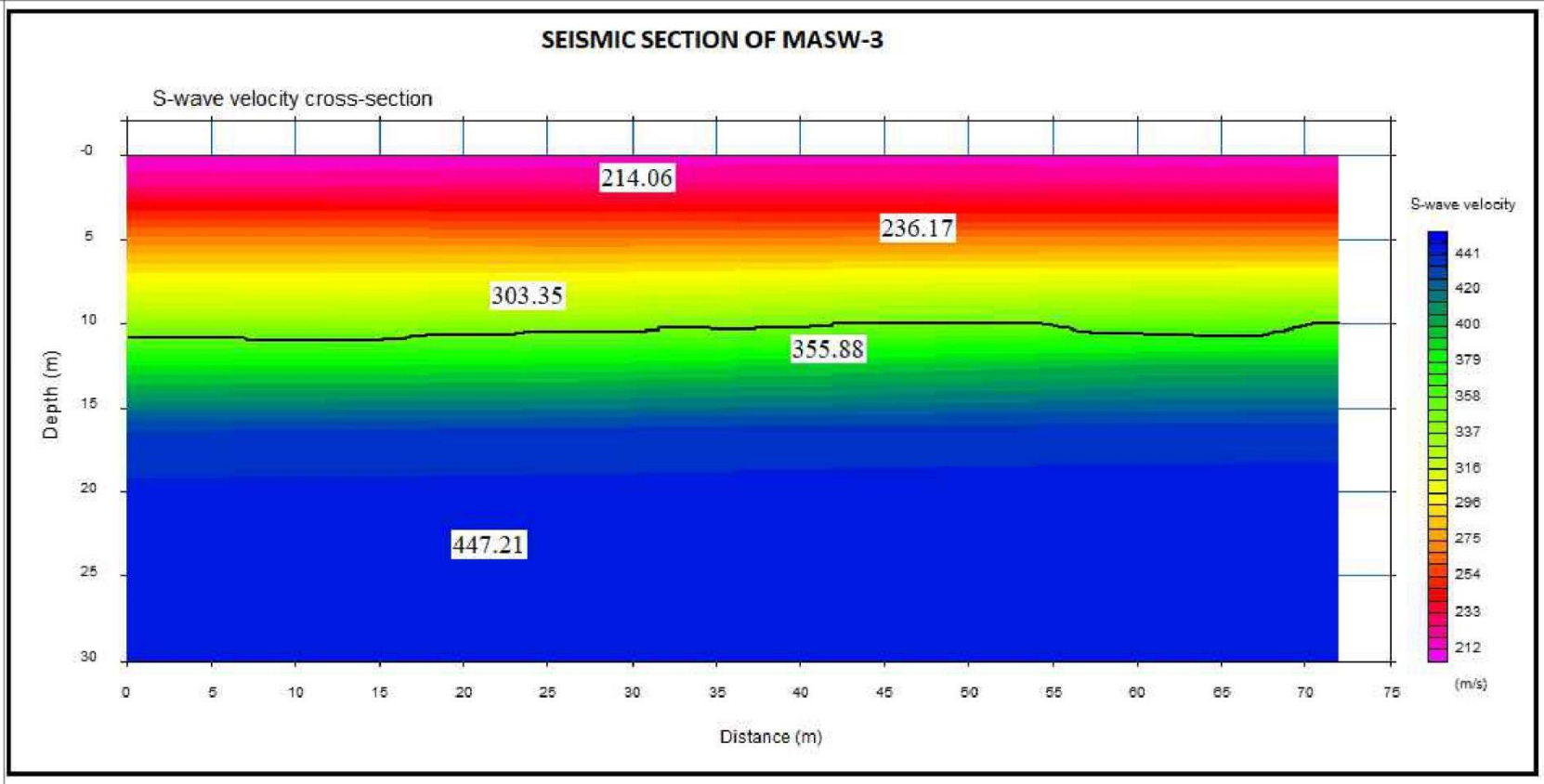
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-2



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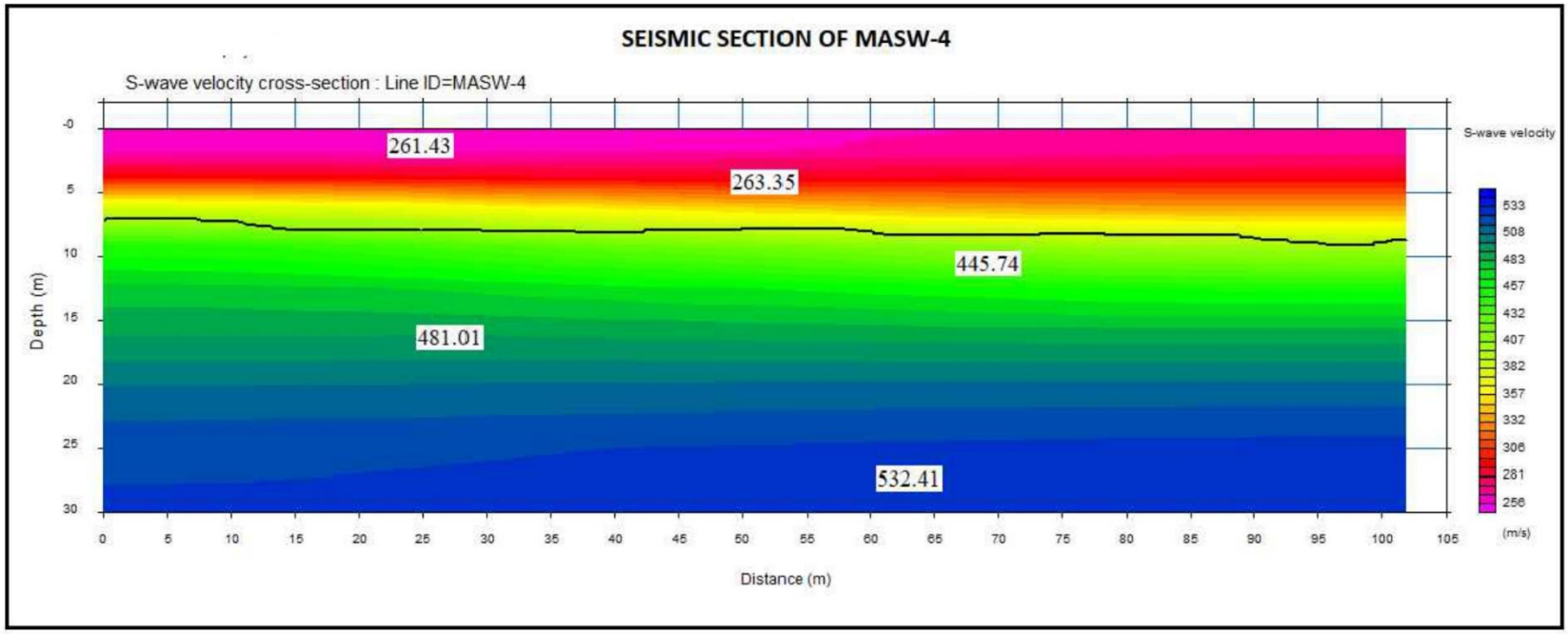
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-3



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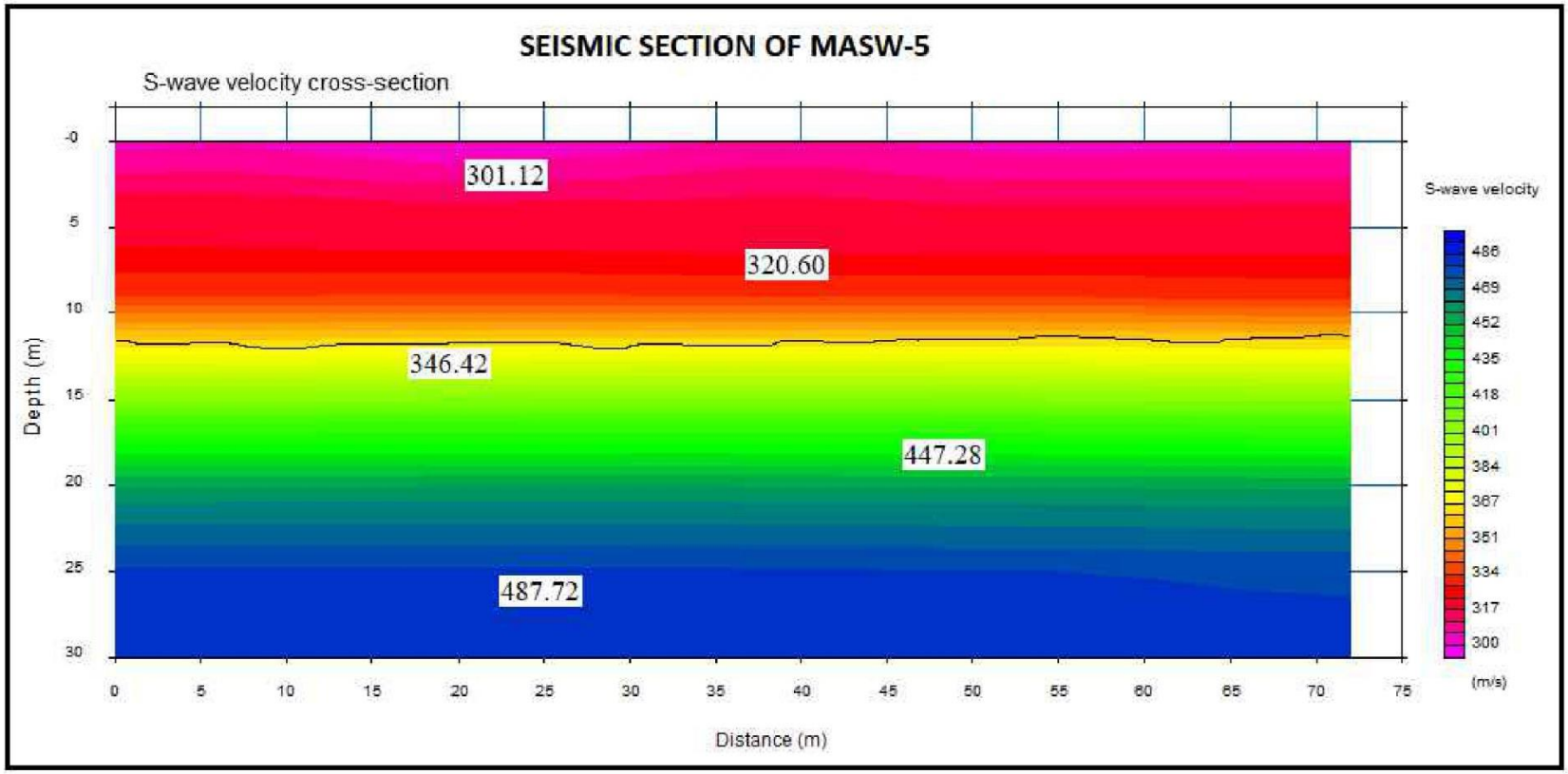
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-4



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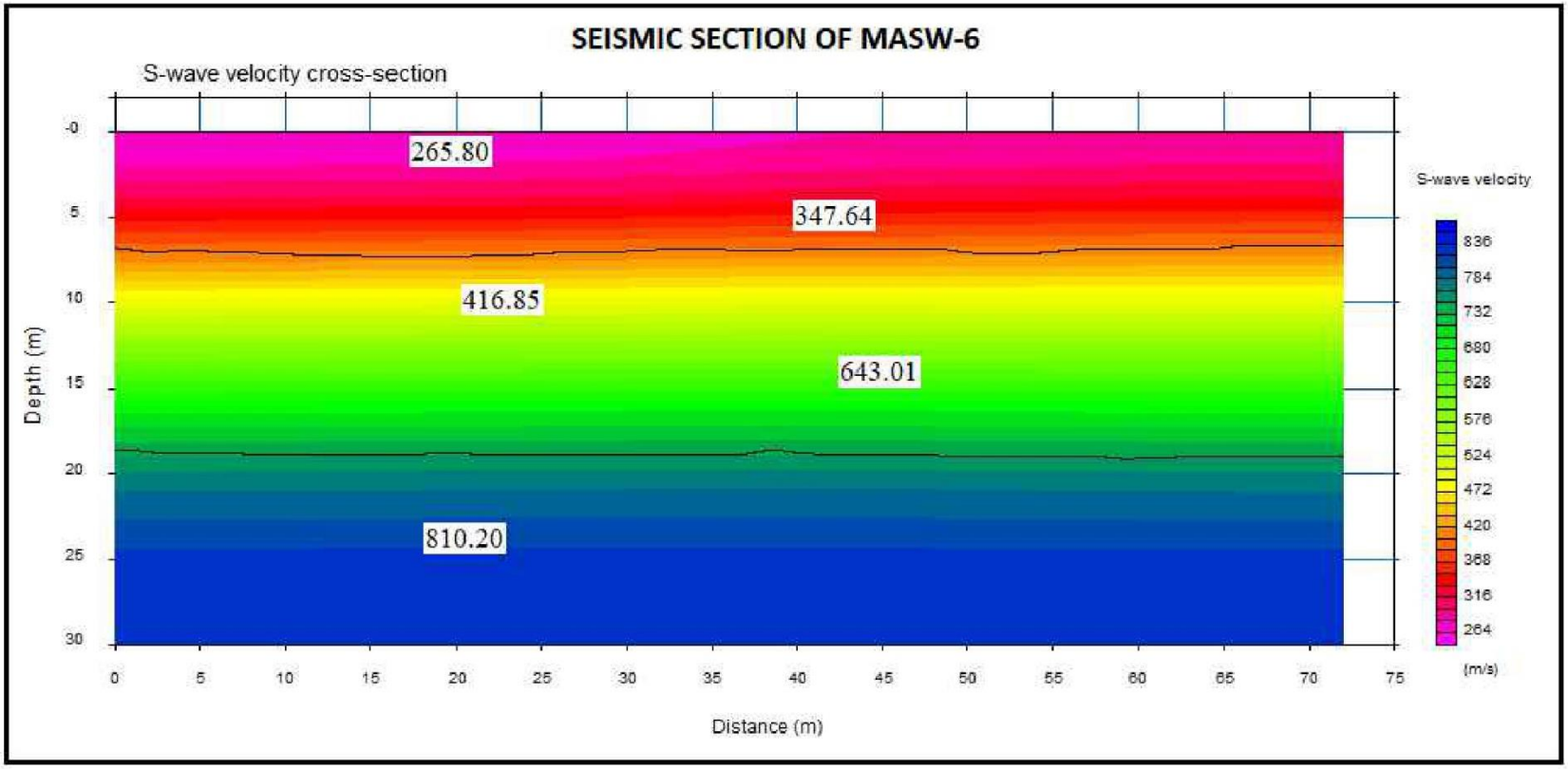
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-5



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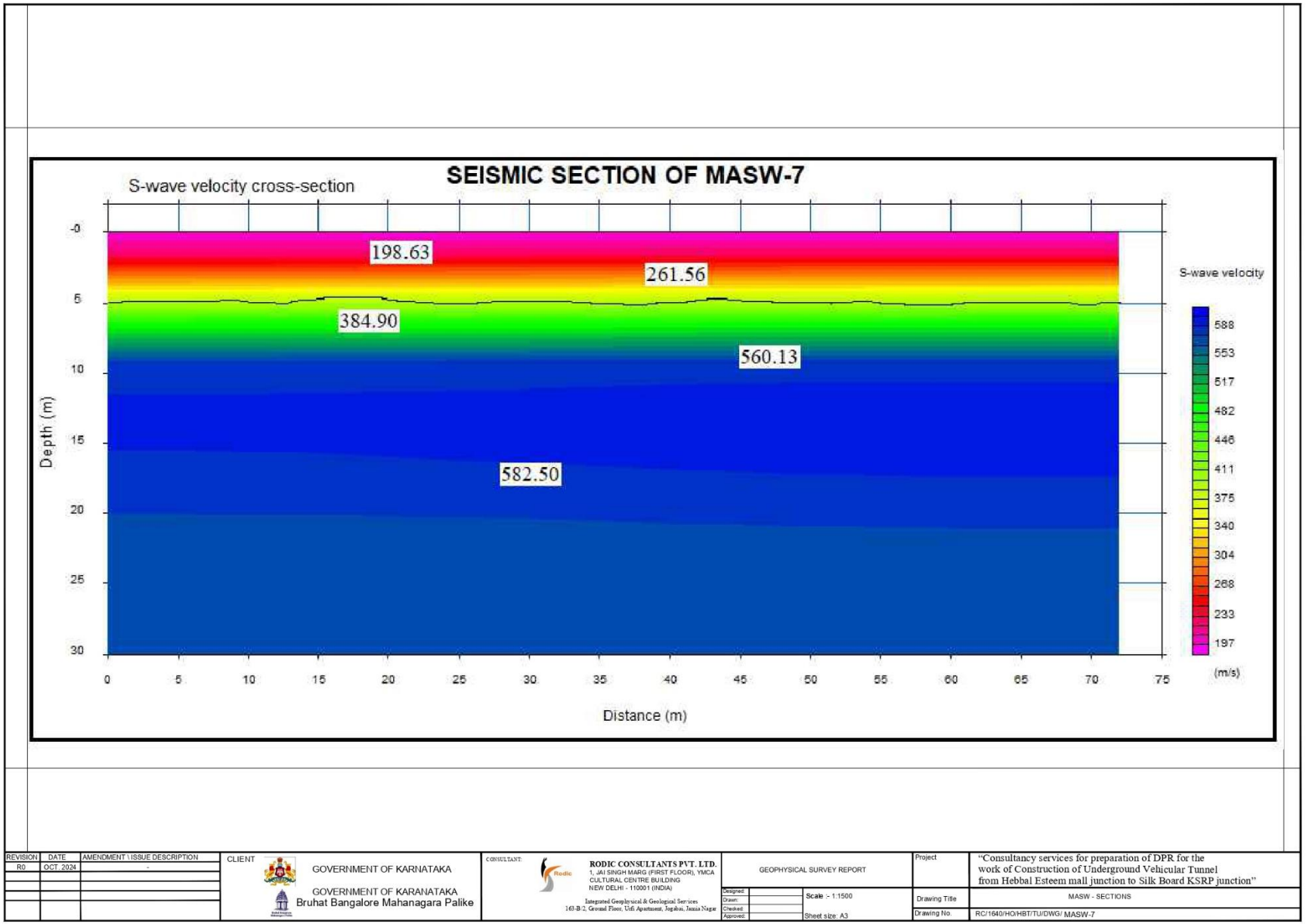
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-6


SEISMIC SECTION OF MASW-7
S-wave velocity cross-section
198.63
261.56
384.90
560.13
582.50
Depth (m)
Distance (m)
S-wave velocity
588
553
517
482
446
411
375
340
304
268
233
197
(m/s)
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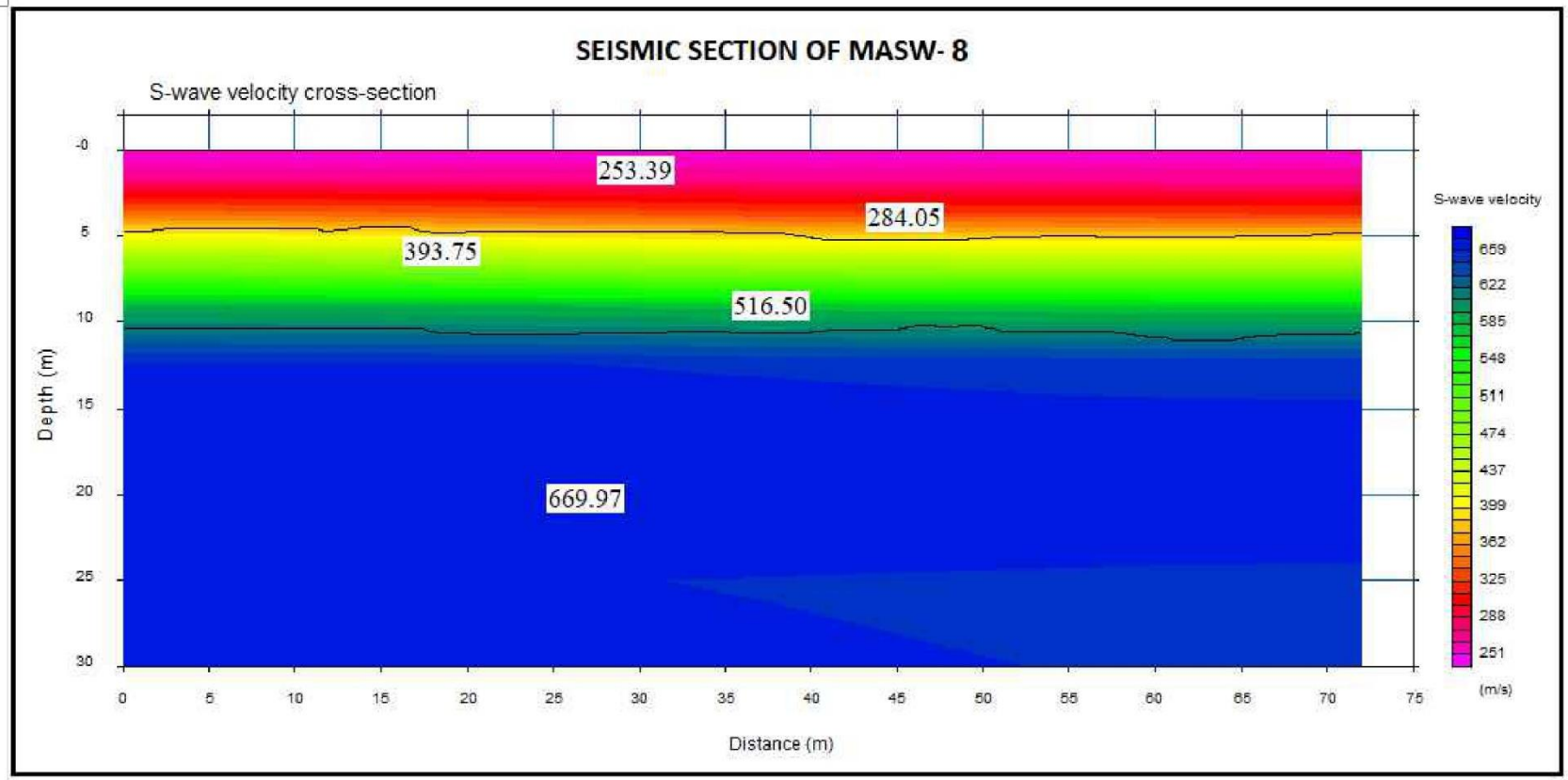
Drawing Title
MASW - SECTIONS
Drawing No.
RC/1640/HO/HBT/TU/DWG/ MASW-7



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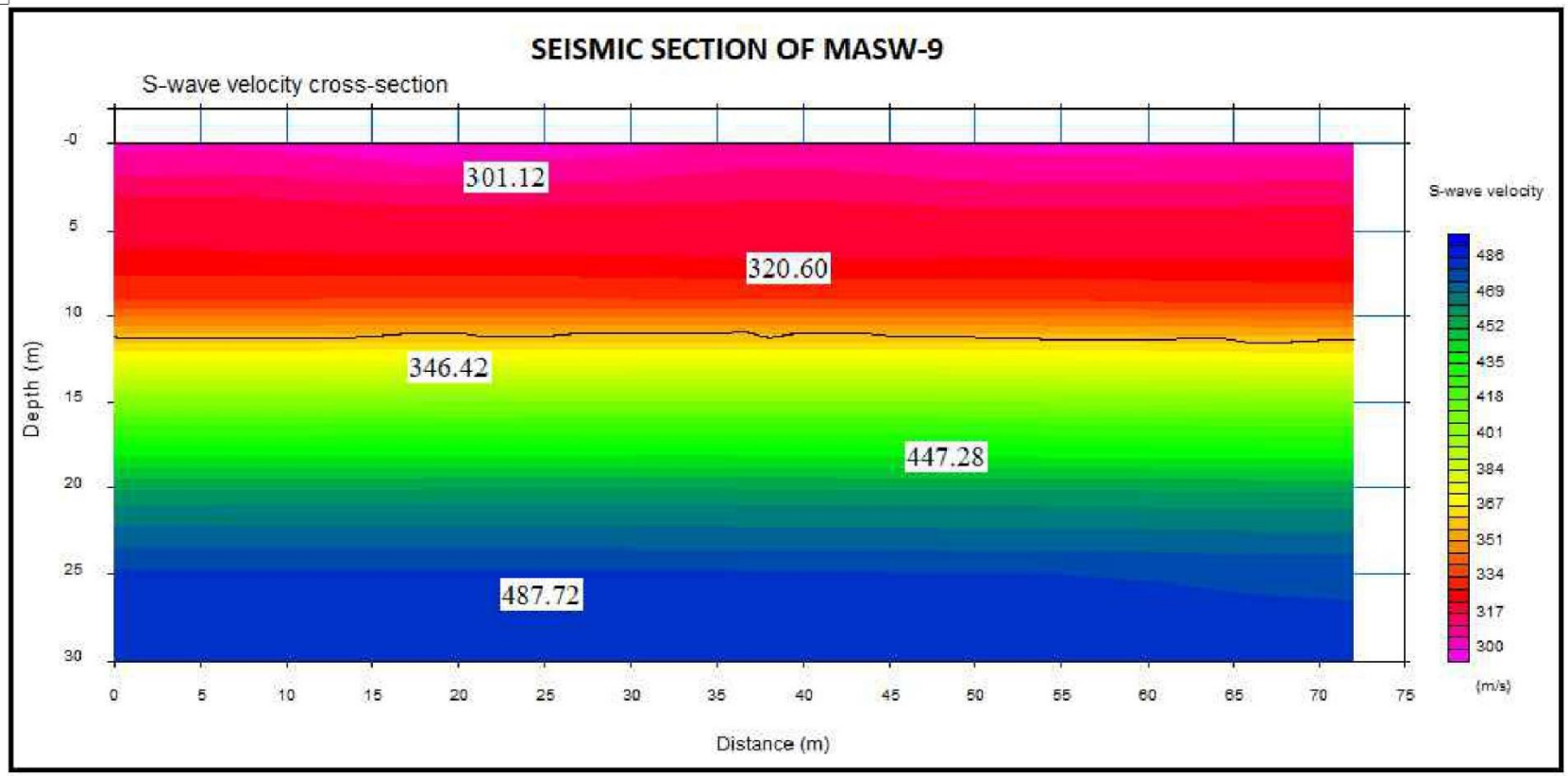
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-8



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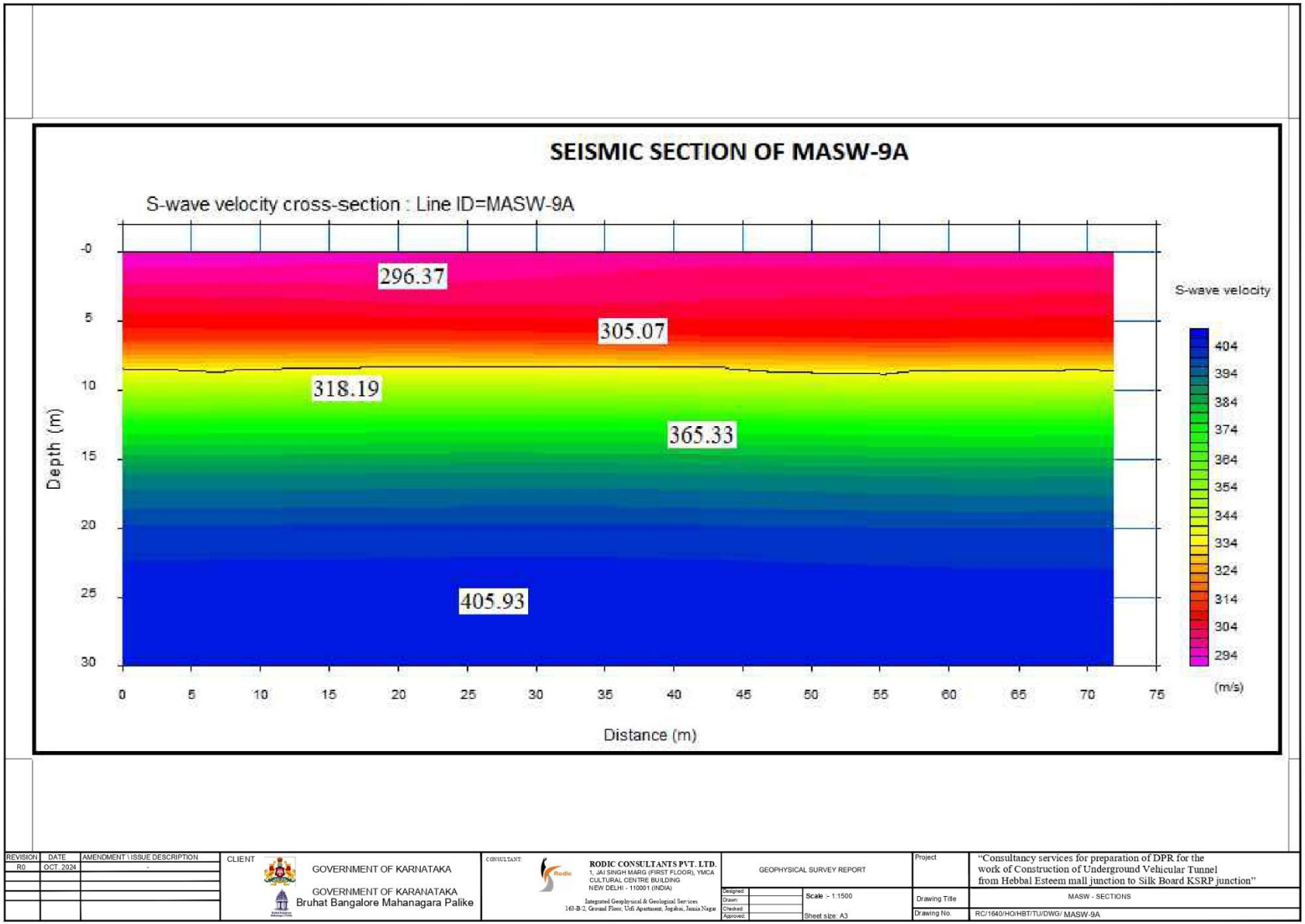
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-9


SEISMIC SECTION OF MASW-9A
S-wave velocity cross-section : Line ID=MASW-9A
296.37
305.07
318.19
365.33
405.93
Depth (m)
Distance (m)
S-wave velocity
404
394
384
374
364
354
344
334
324
314
304
294
(m/s)
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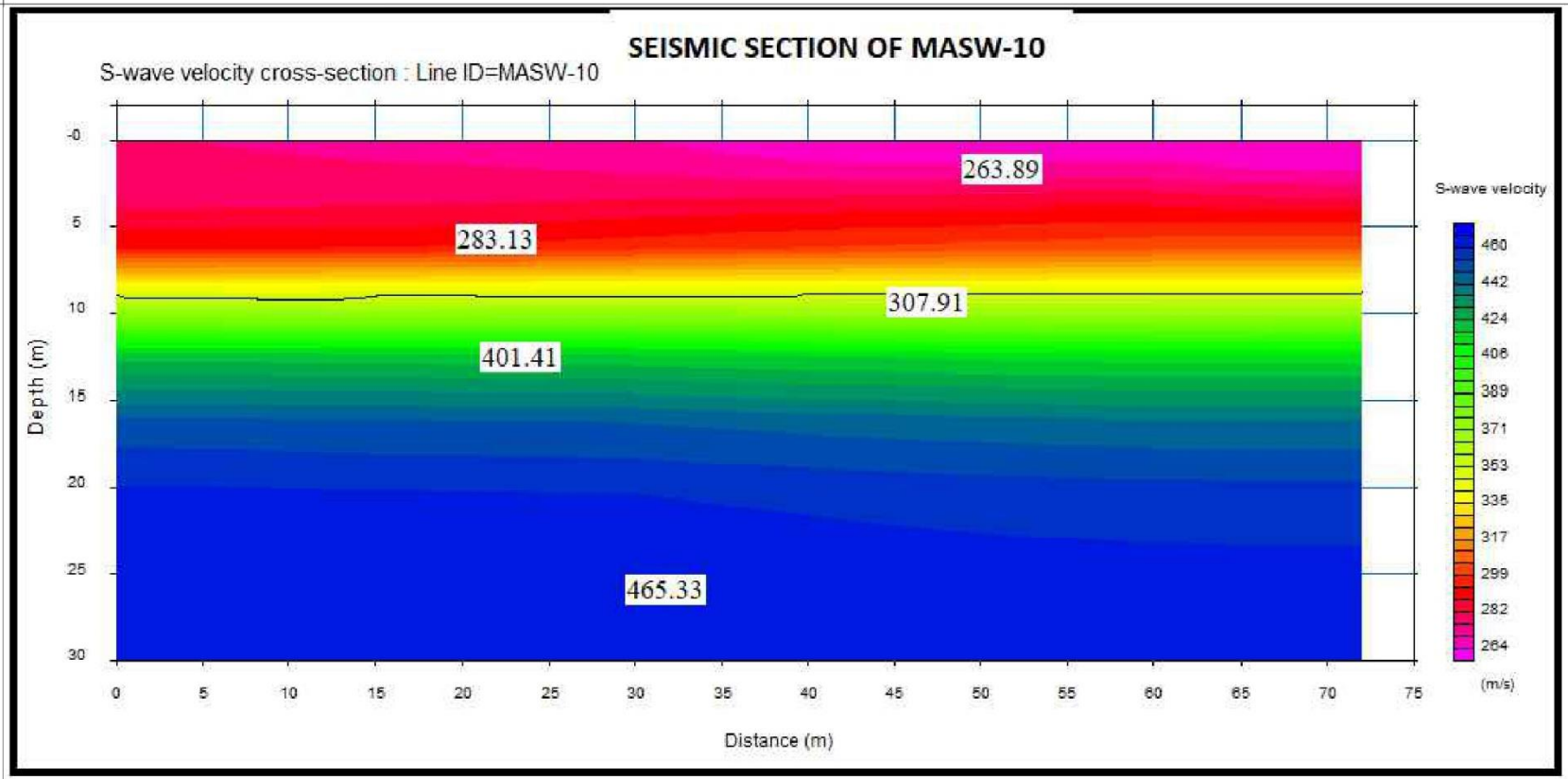
Drawing Title
MASW - SECTIONS
Drawing No.
RC/1640/HO/HBT/TU/DWG/ MASW-9A



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Bruhat Bangalore Mahanagara Palike

CONSULTANT: RODIC CONSULTANTS PVT. LTD.
1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING
NEW DELHI - 110001 (INDIA)
Integrated Geophysical & Geological Services
163-B/2, Ground Floor, Urfi Apartment, Jogabai, Jamia Nagar

GEOPHYSICAL SURVEY REPORT

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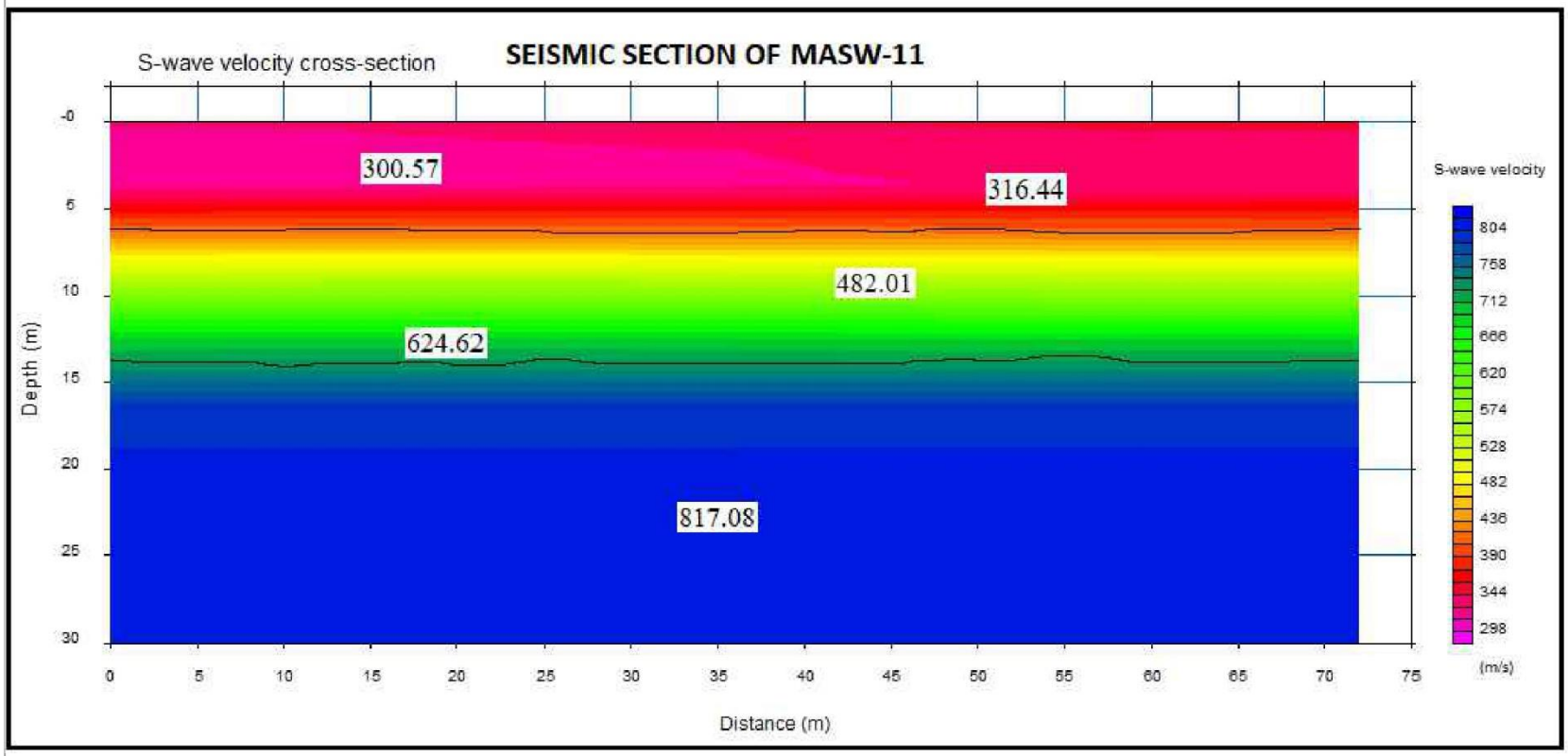
Scale :- 1:1500
Sheet size: A3

Project	"Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-10



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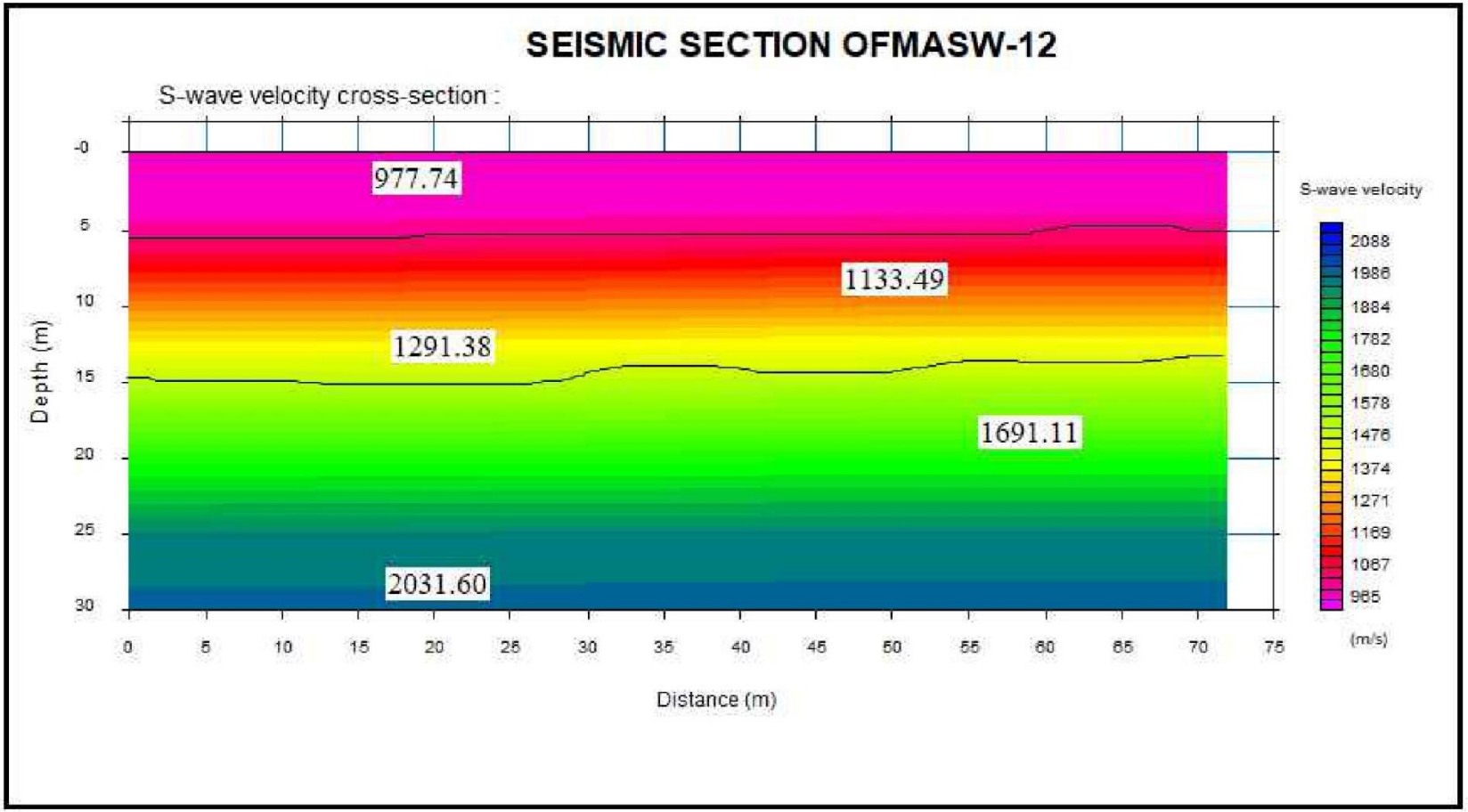
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-11



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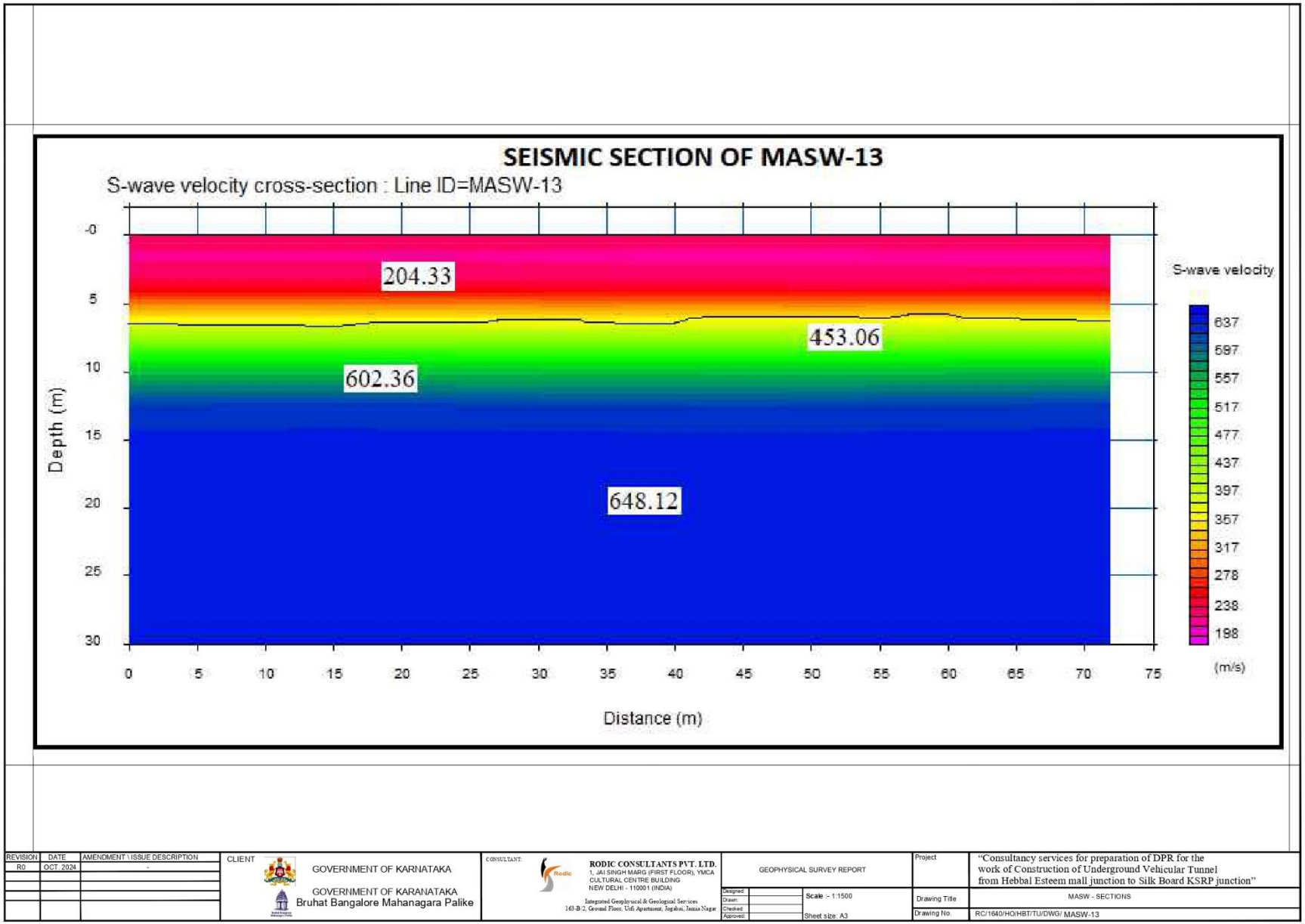
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-12



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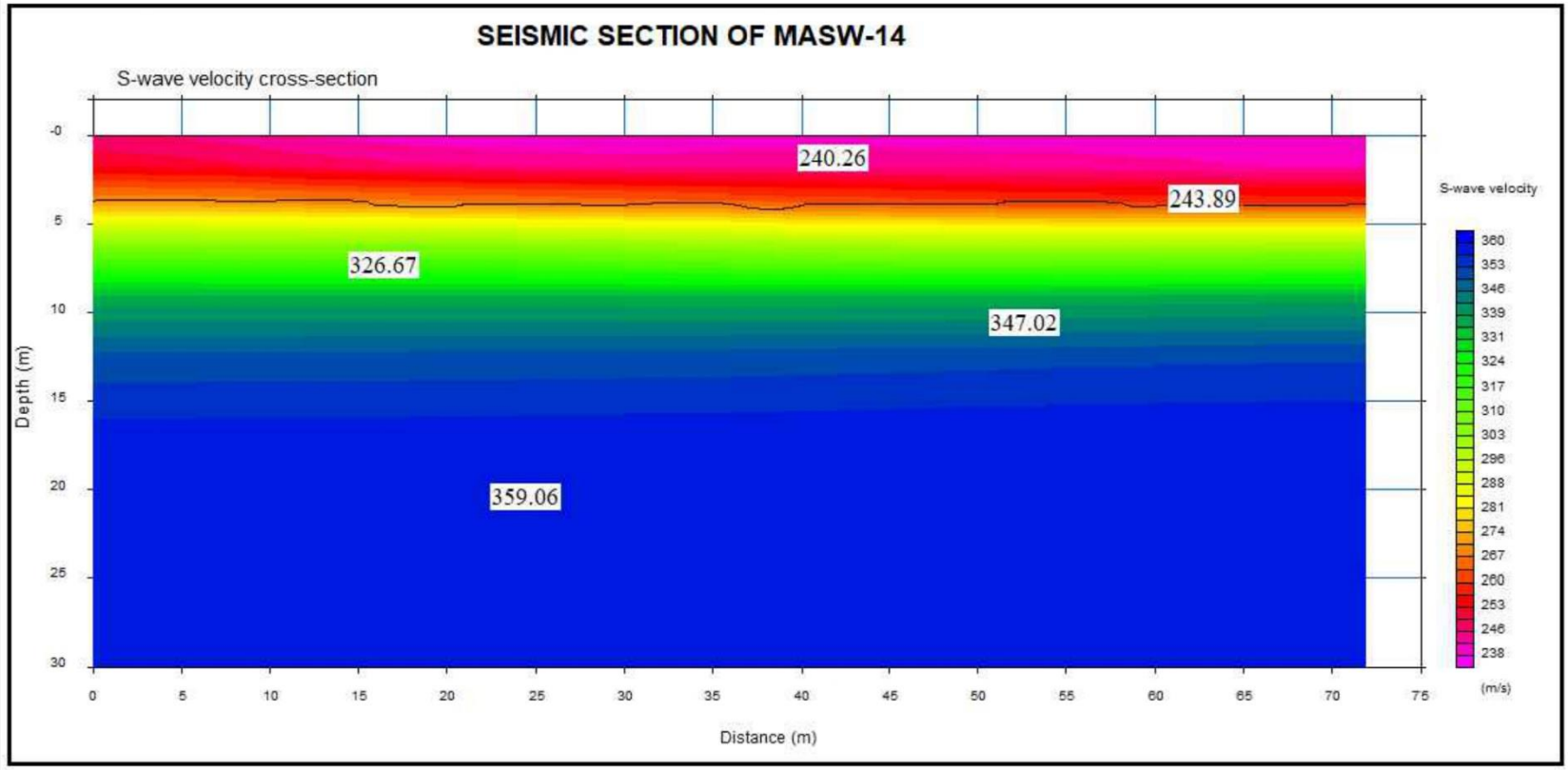
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-13



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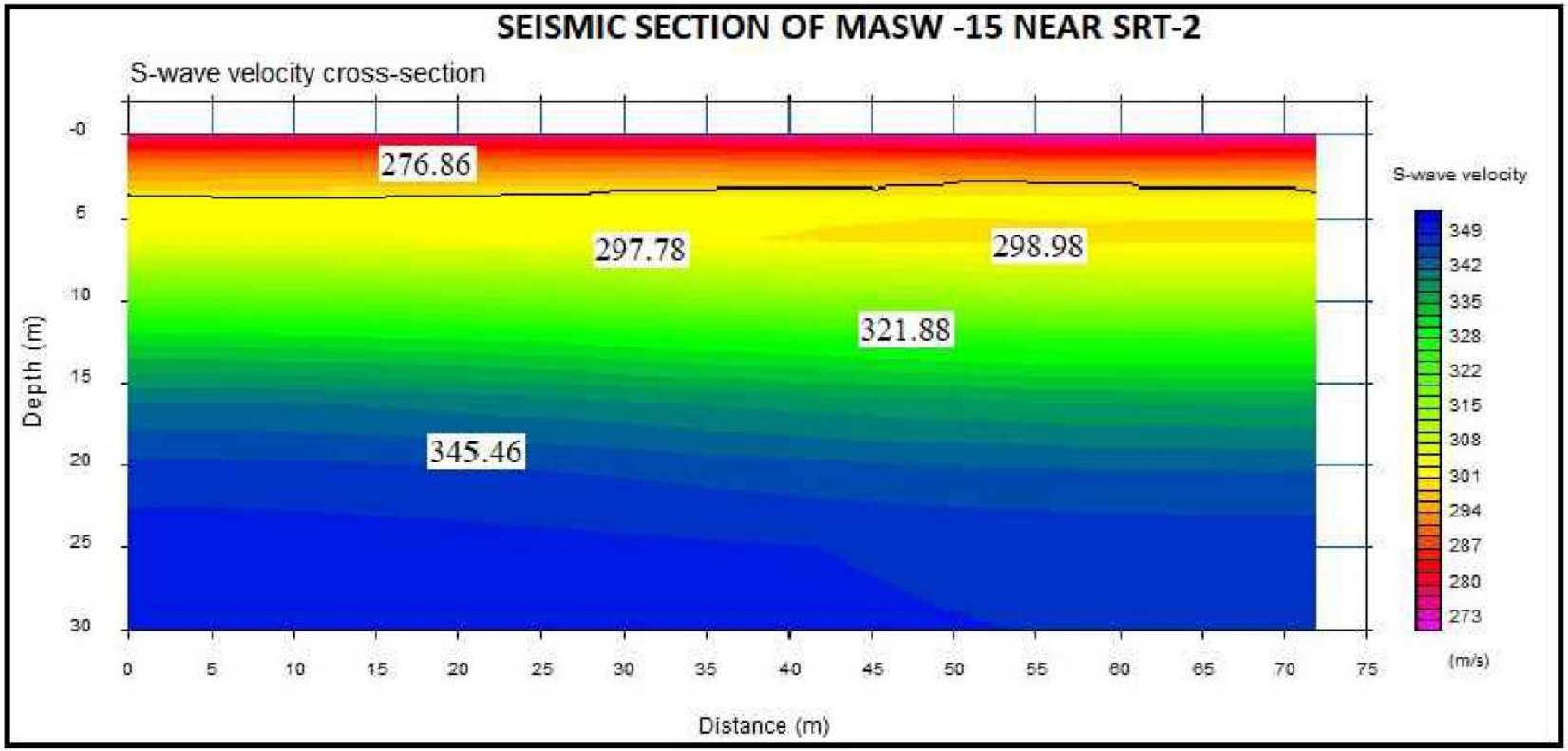
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-14



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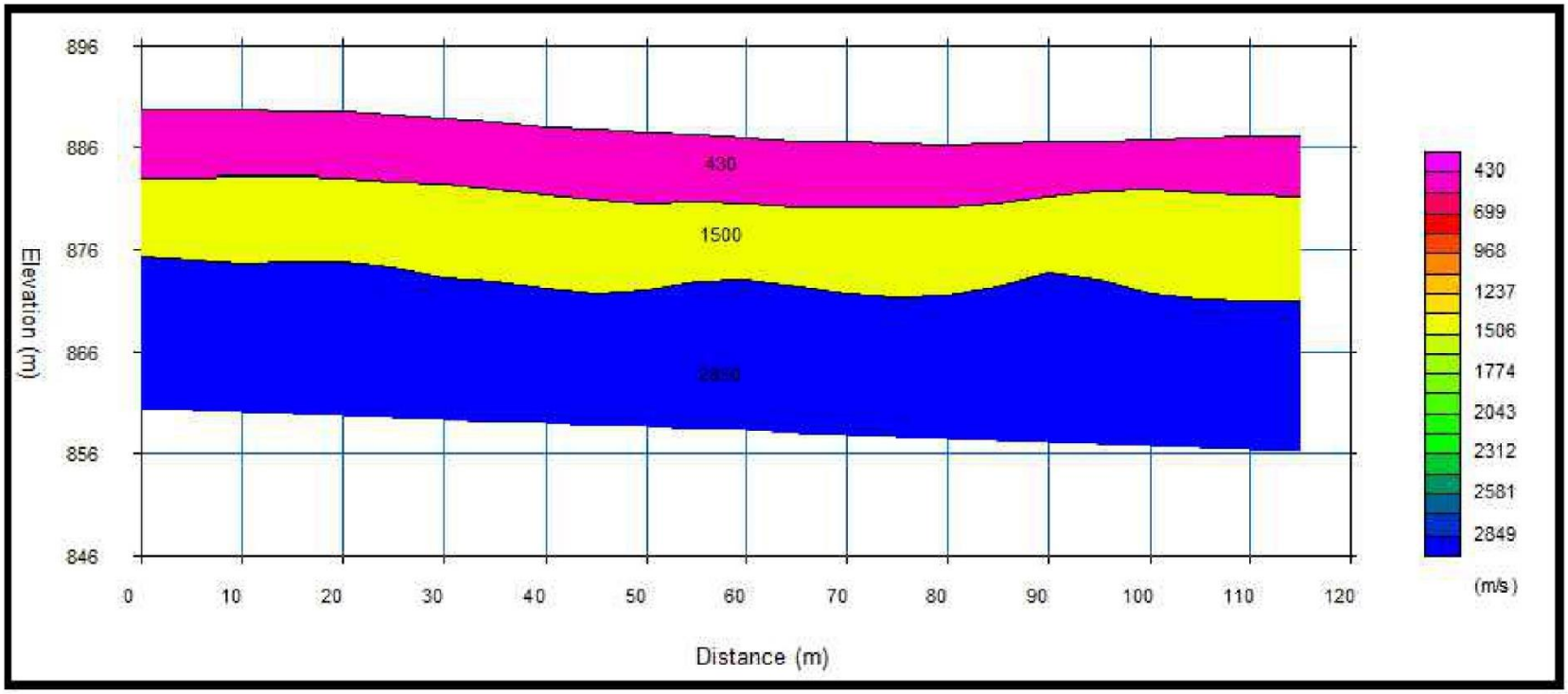
Drawing Title	MASW - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ MASW-15

SRT-1-SECTION



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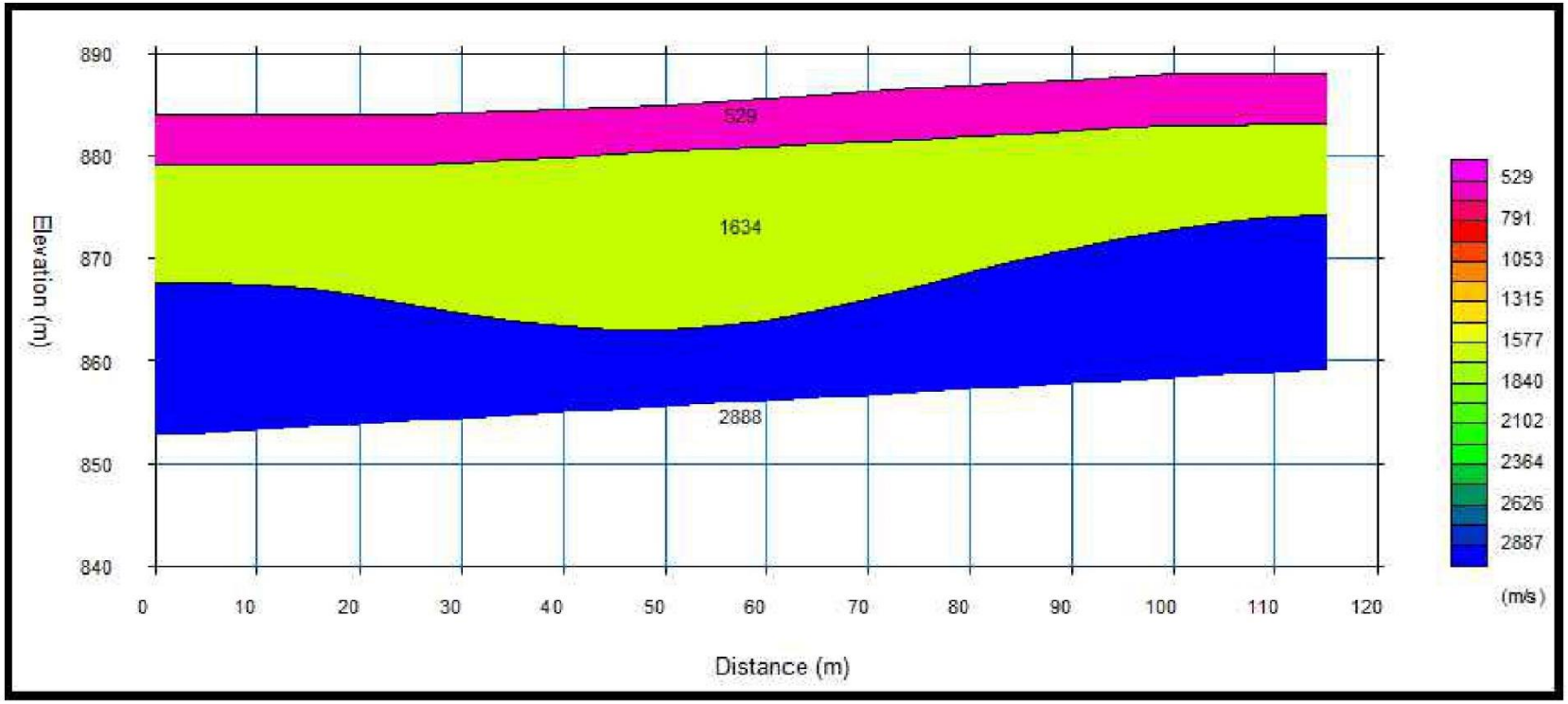
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-1

SRT-1A-SECTION



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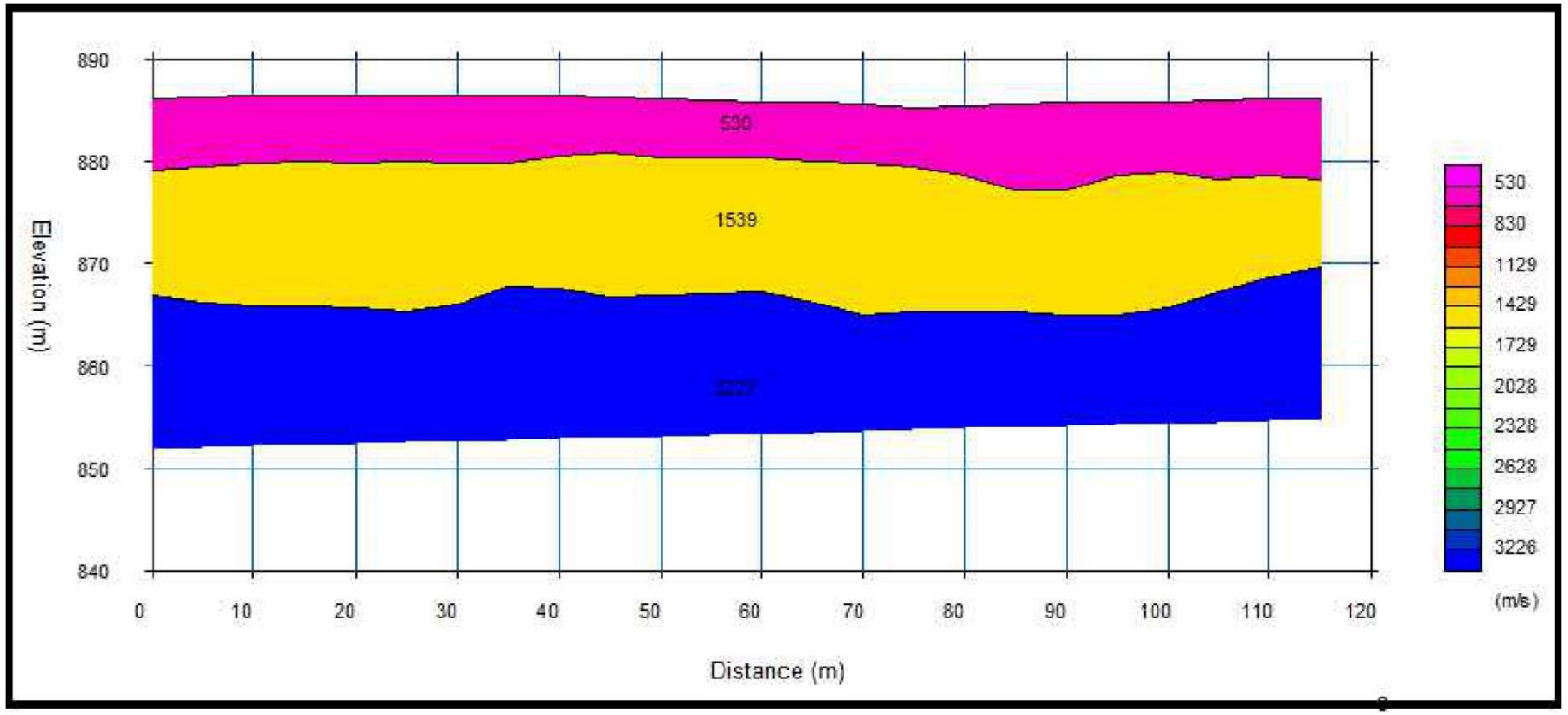
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-1A

SRT-1B-SECTION



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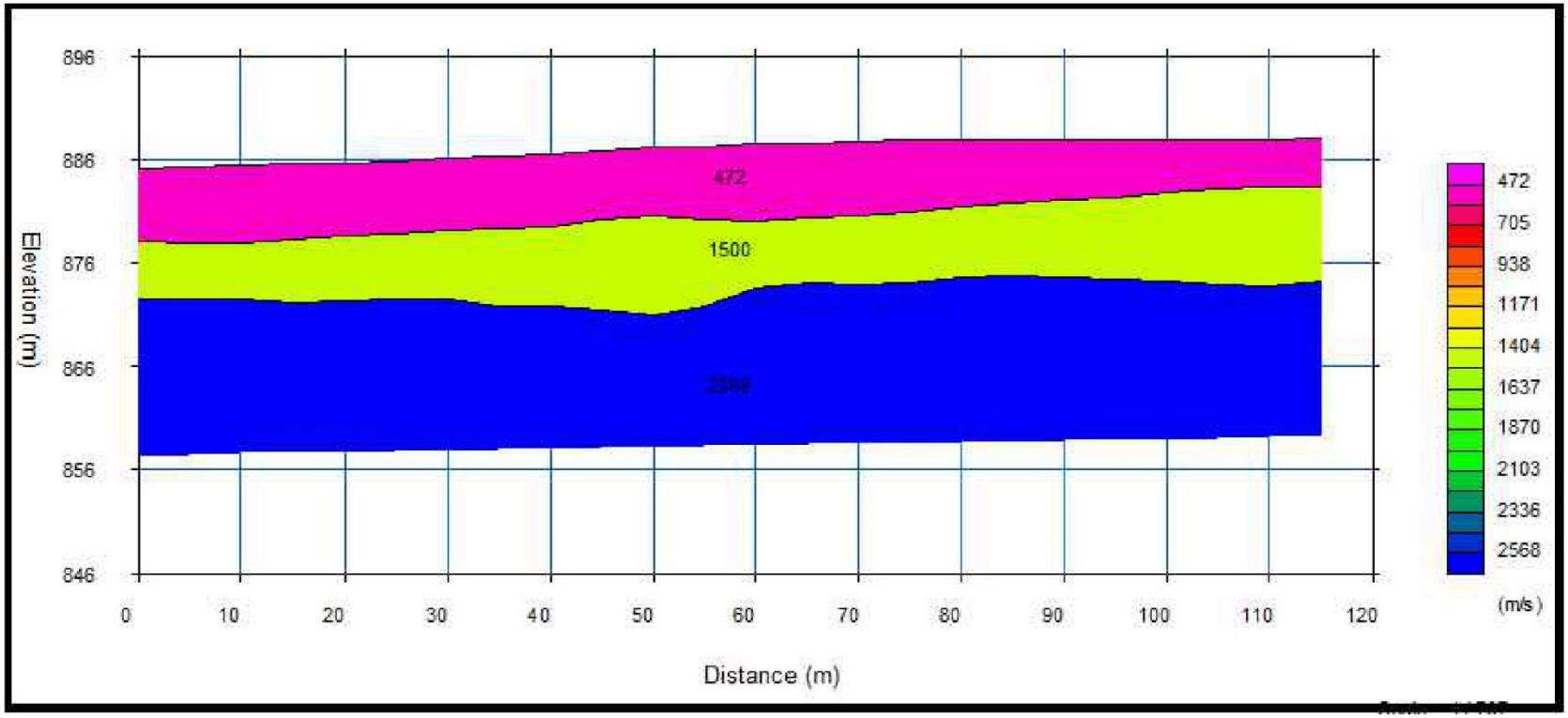
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-1B

SRT-1C-SECTION



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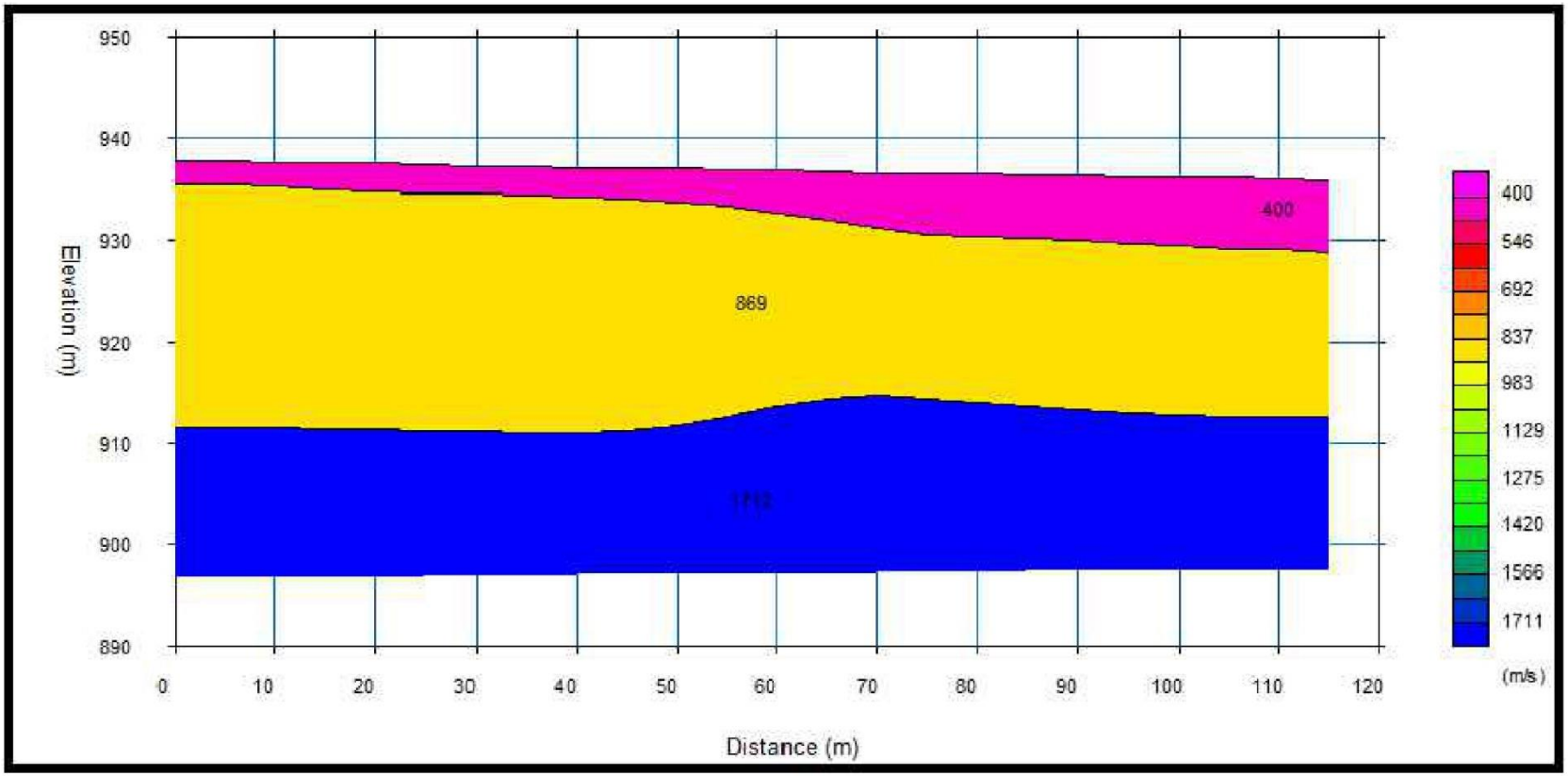
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-1C

SRT-2-SECTION



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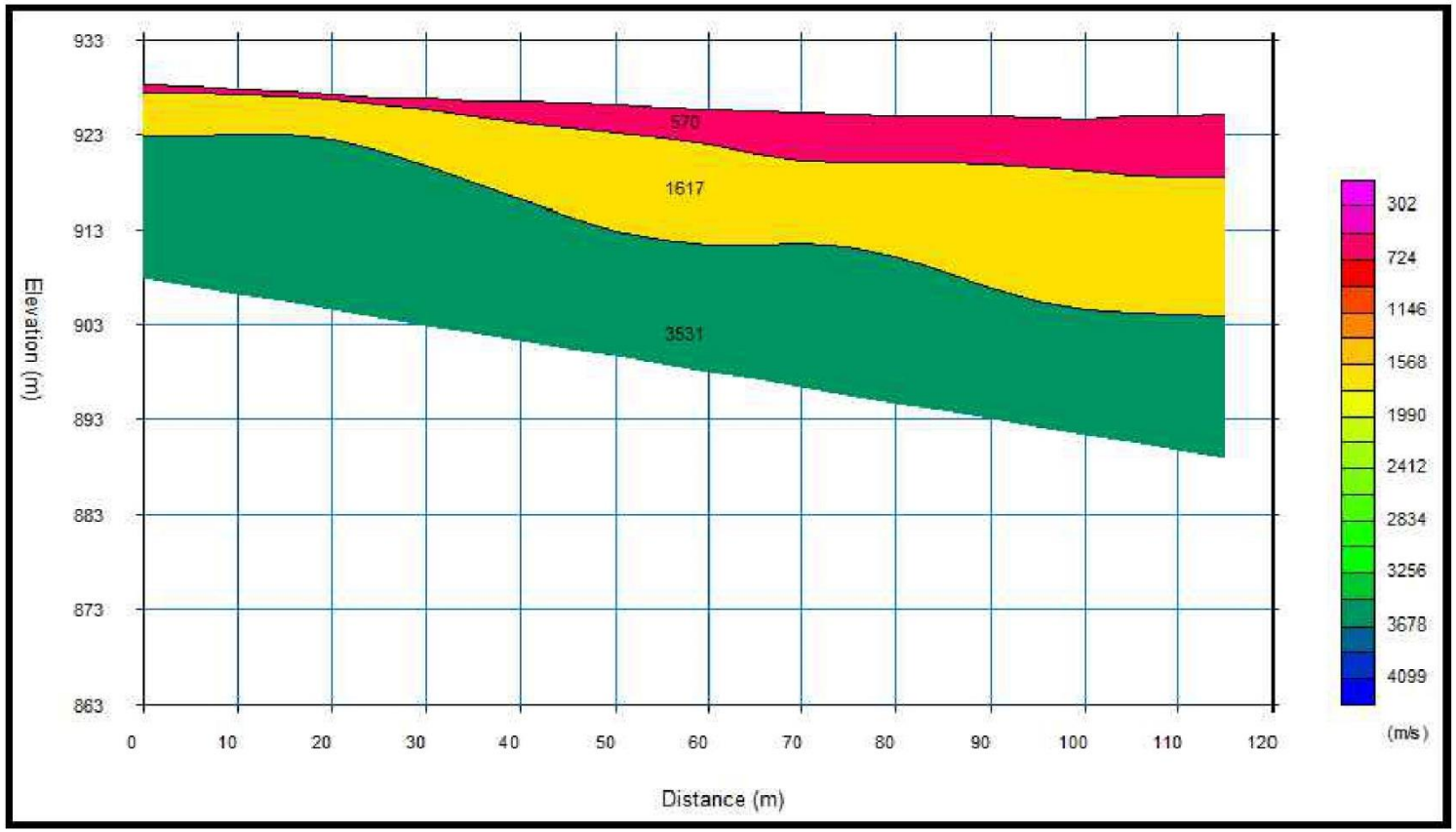
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-2

SRT-3A-SECTION



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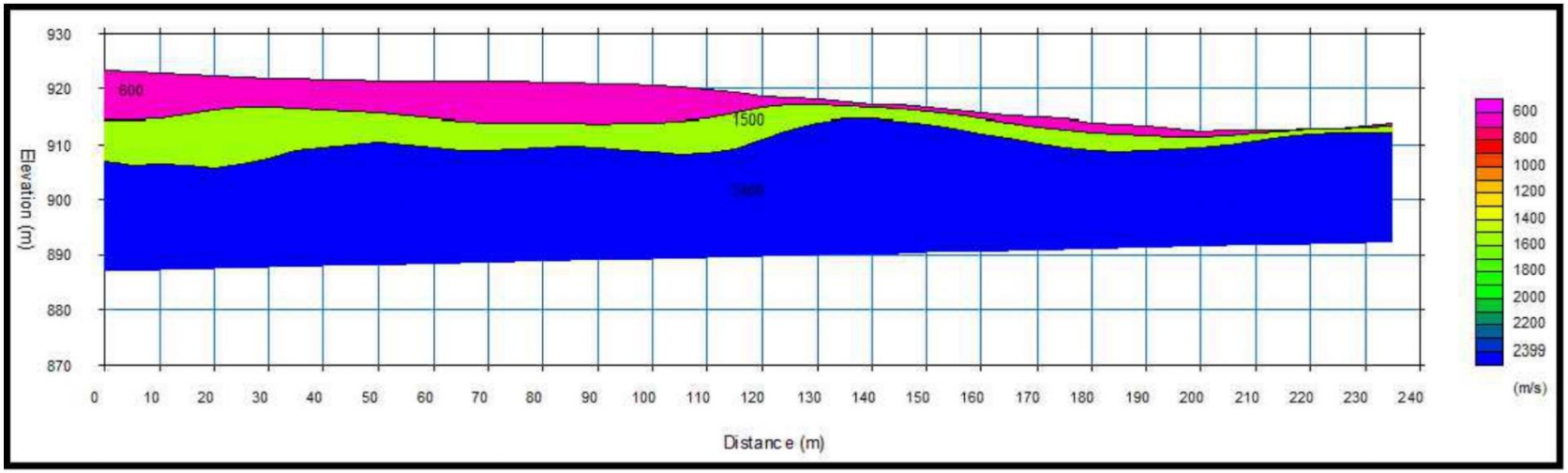
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-3A

SRT-4AB-SECTION



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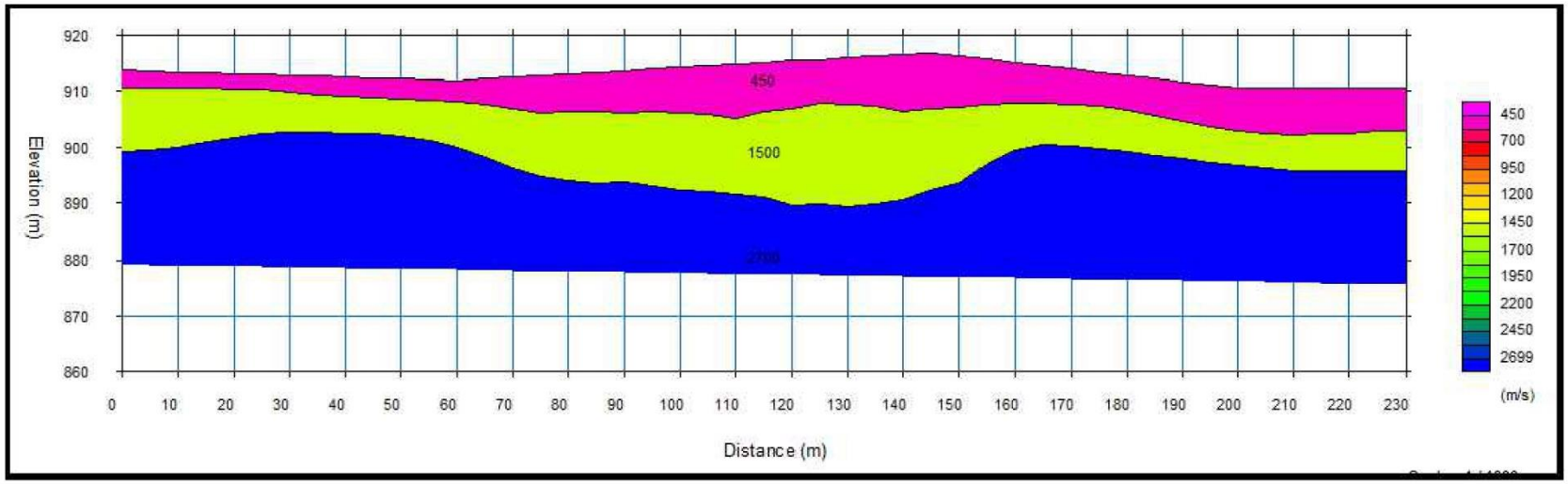
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-4AB

SRT-5AB-SECTION



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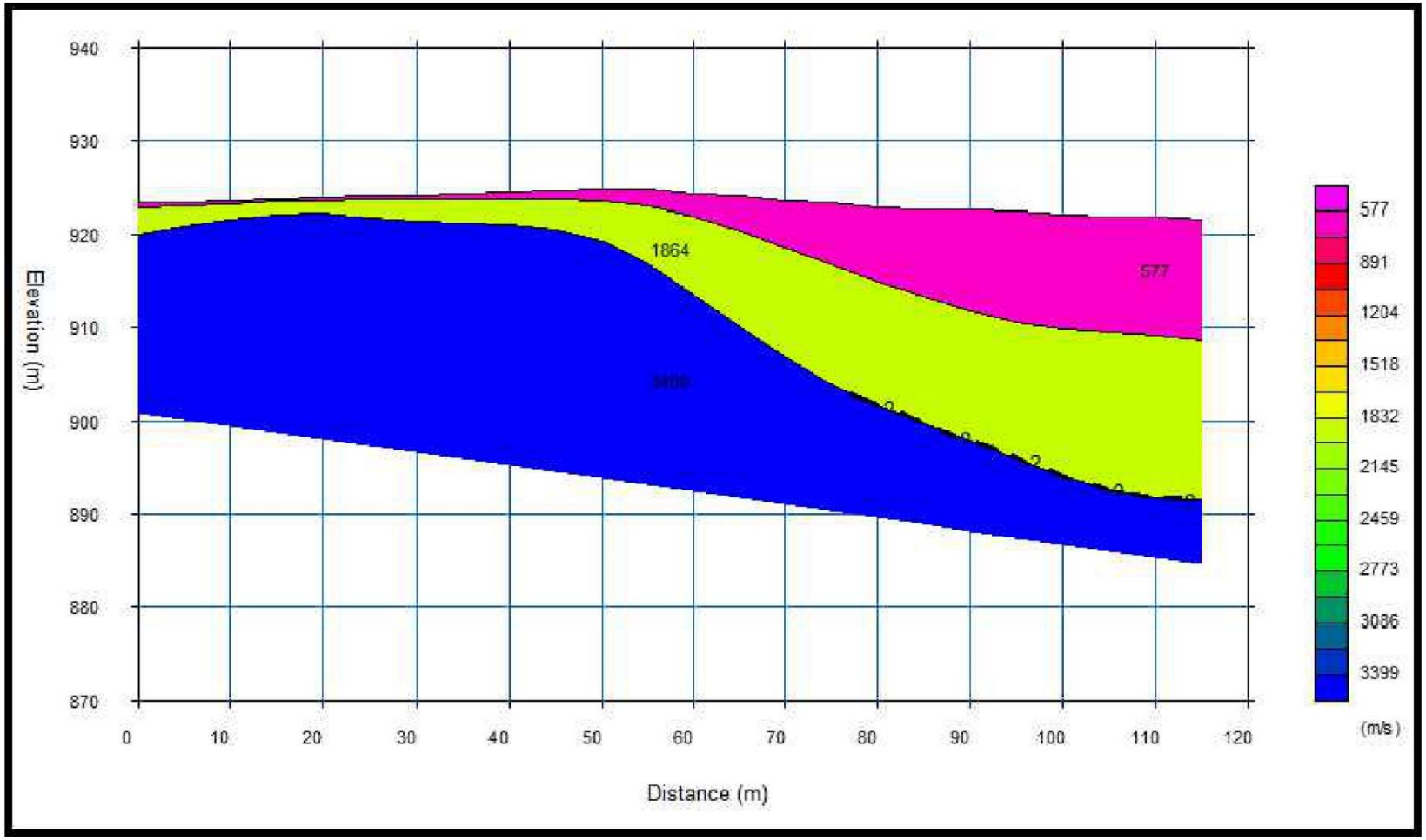
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-5AB

SRT-6-SECTION



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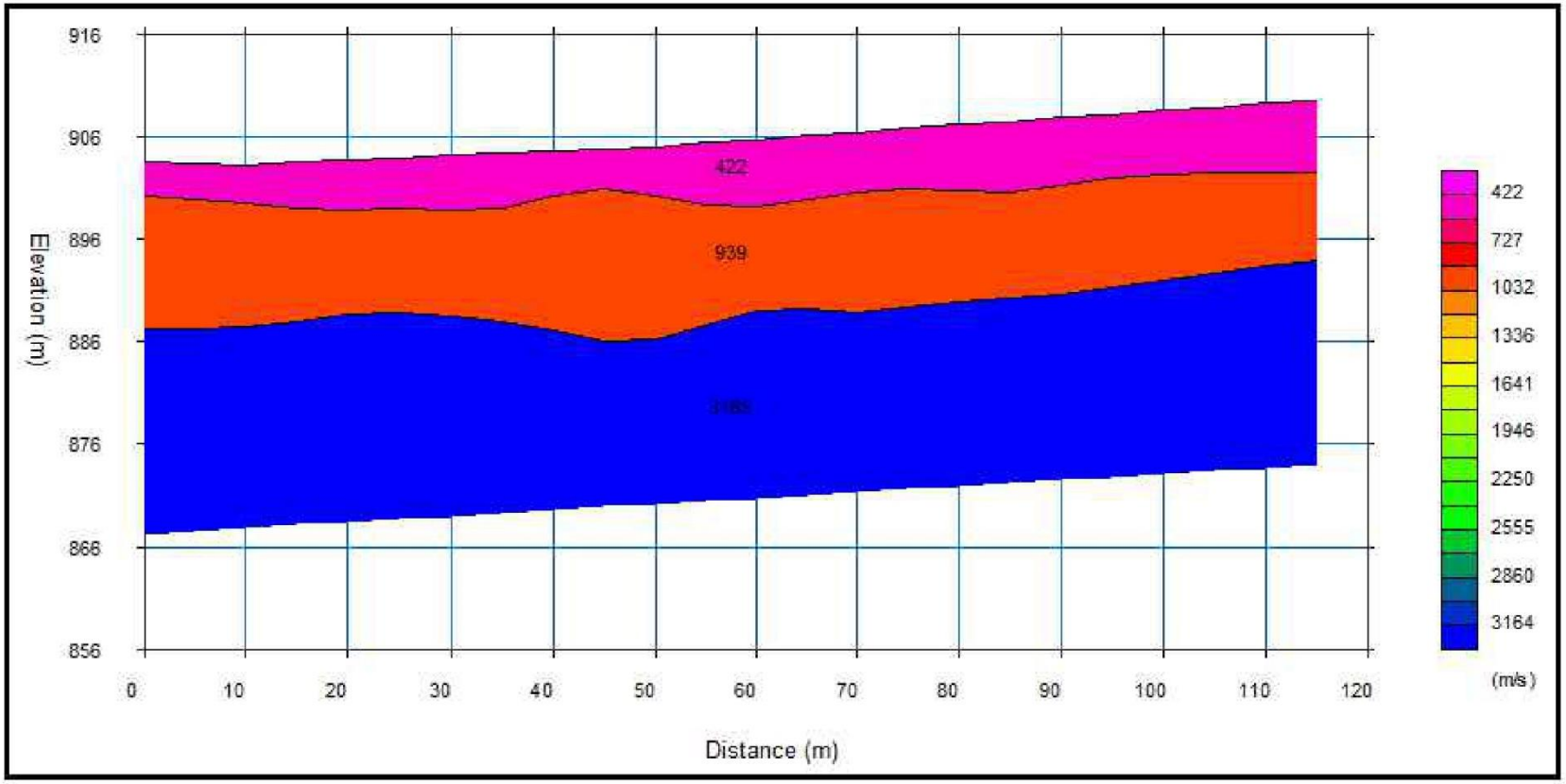
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-6

SRT-7-SECTION



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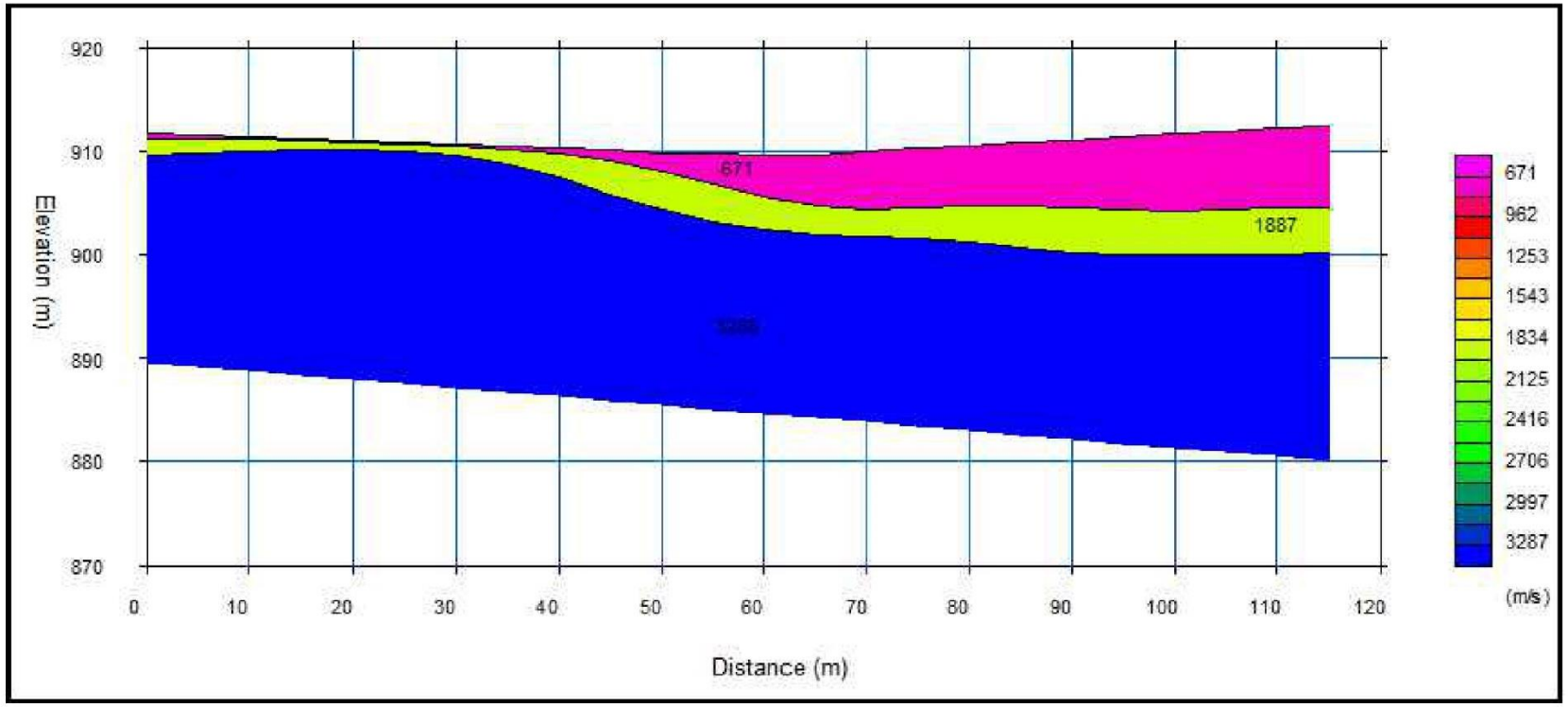
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-7

SRT-7A-SECTION



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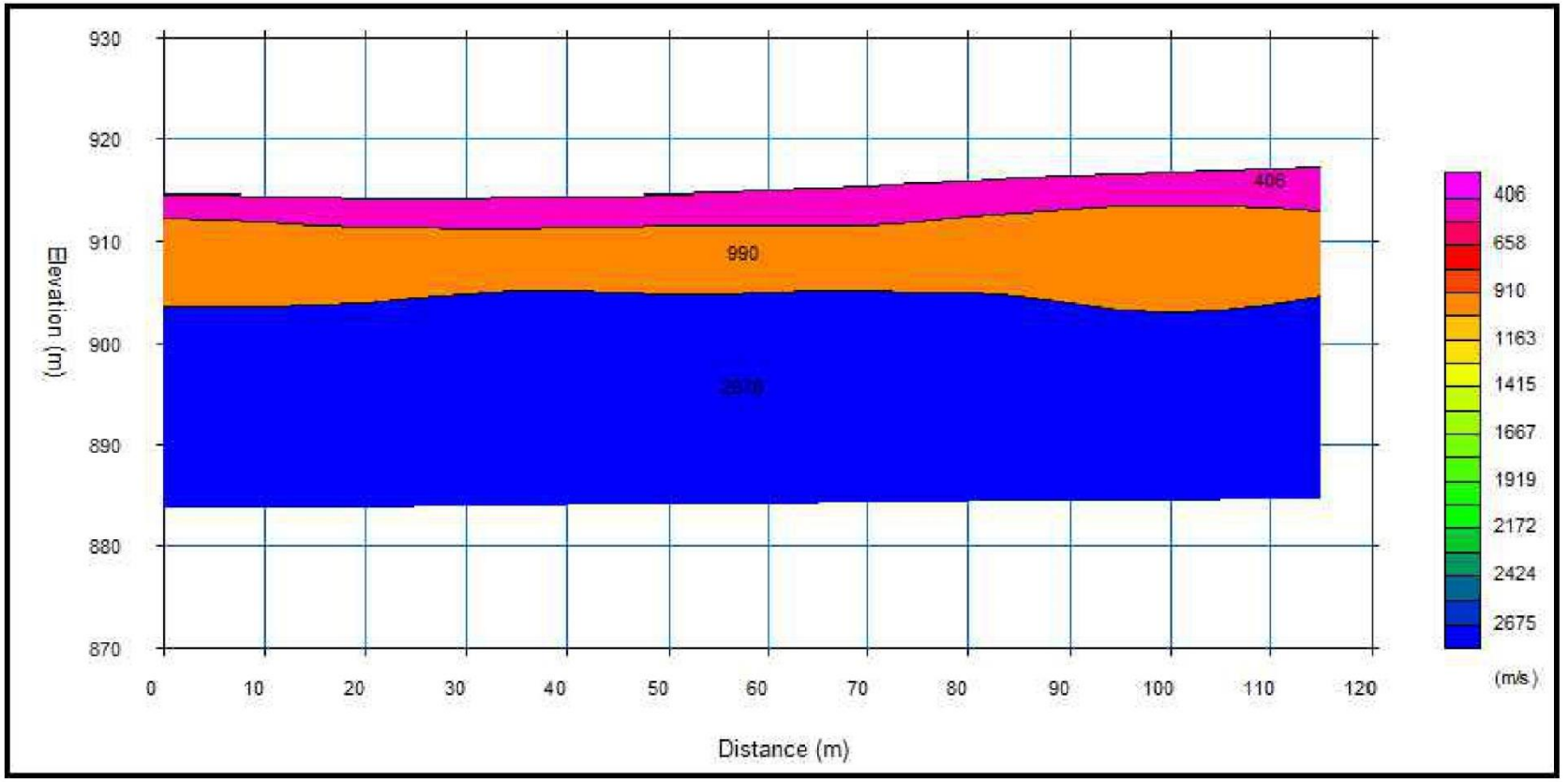
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-7A

SRT-9 -SECTION



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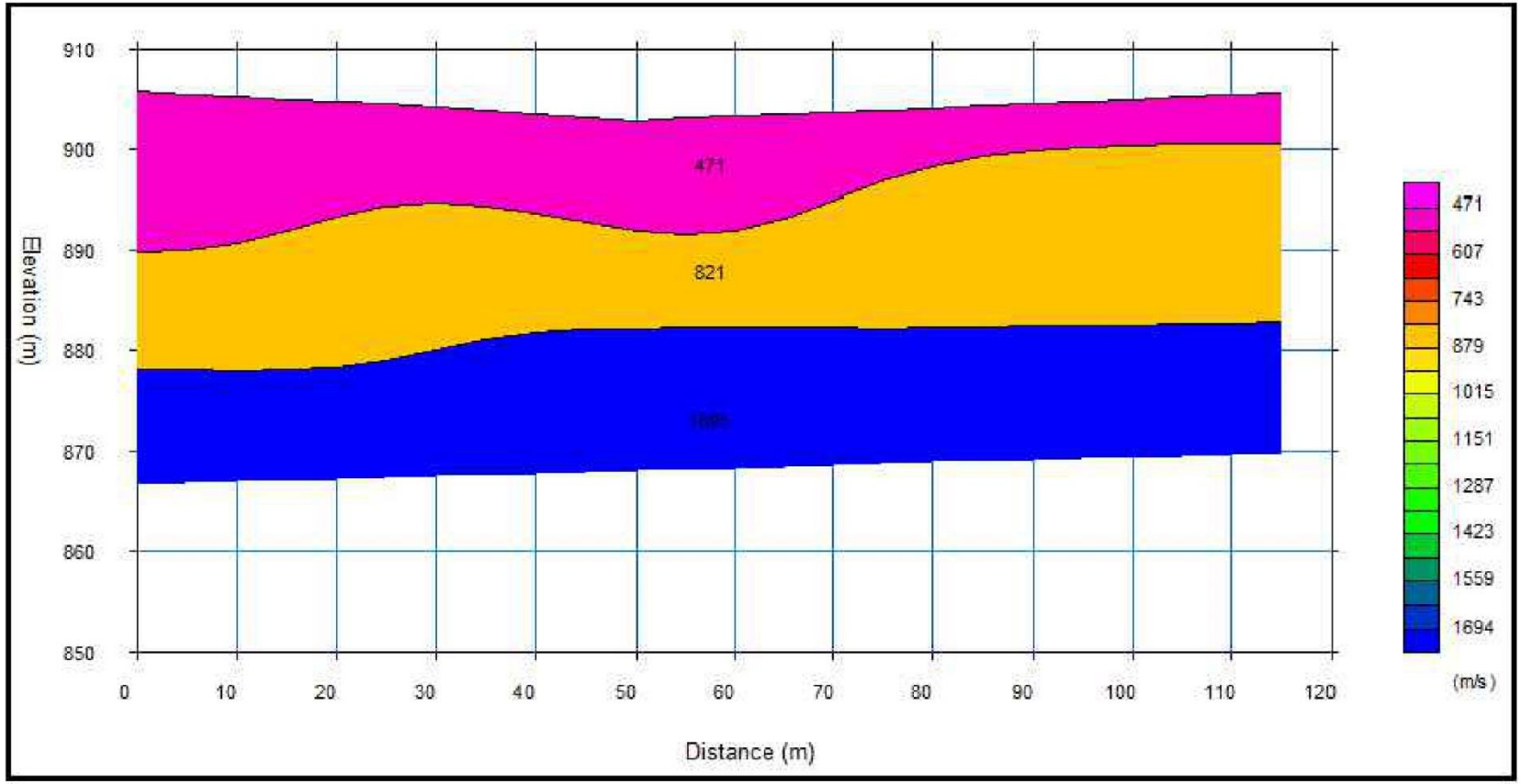
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-9

SRT-10 -SECTION



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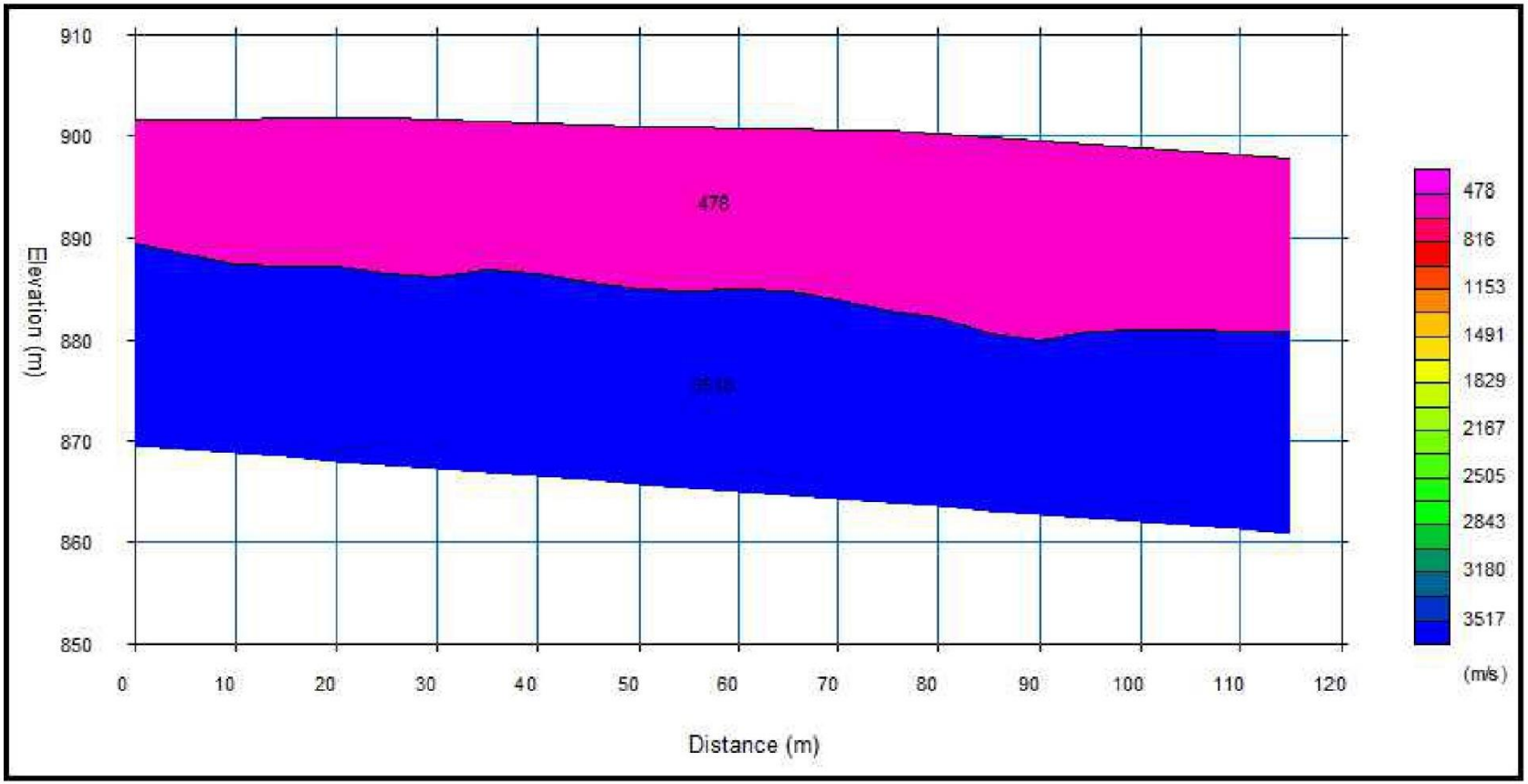
Project	"Consultancy services for preparation of DPR for the work of Construction of Underground Vehicular Tunnel from Hebbal Esteem mall junction to Silk Board KSRP junction"
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-10

SRT-11A -SECTION



REVISION	DATE	AMENDMENT \ ISSUE DESCRIPTION
R0	OCT. 2024	-

CLIENT: GOVERNMENT OF KARNATAKA
GOVERNMENT OF KARANATAKA
Bruhat Bangalore Mahanagara Palike

CONSULTANT: RODIC CONSULTANTS PVT. LTD.
1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING
NEW DELHI - 110001 (INDIA)
Integrated Geophysical & Geological Services
183-B/2, Ground Floor, Urfi Apartment, Jogabai, Jamia Nagar

GEOPHYSICAL SURVEY REPORT

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Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-11A

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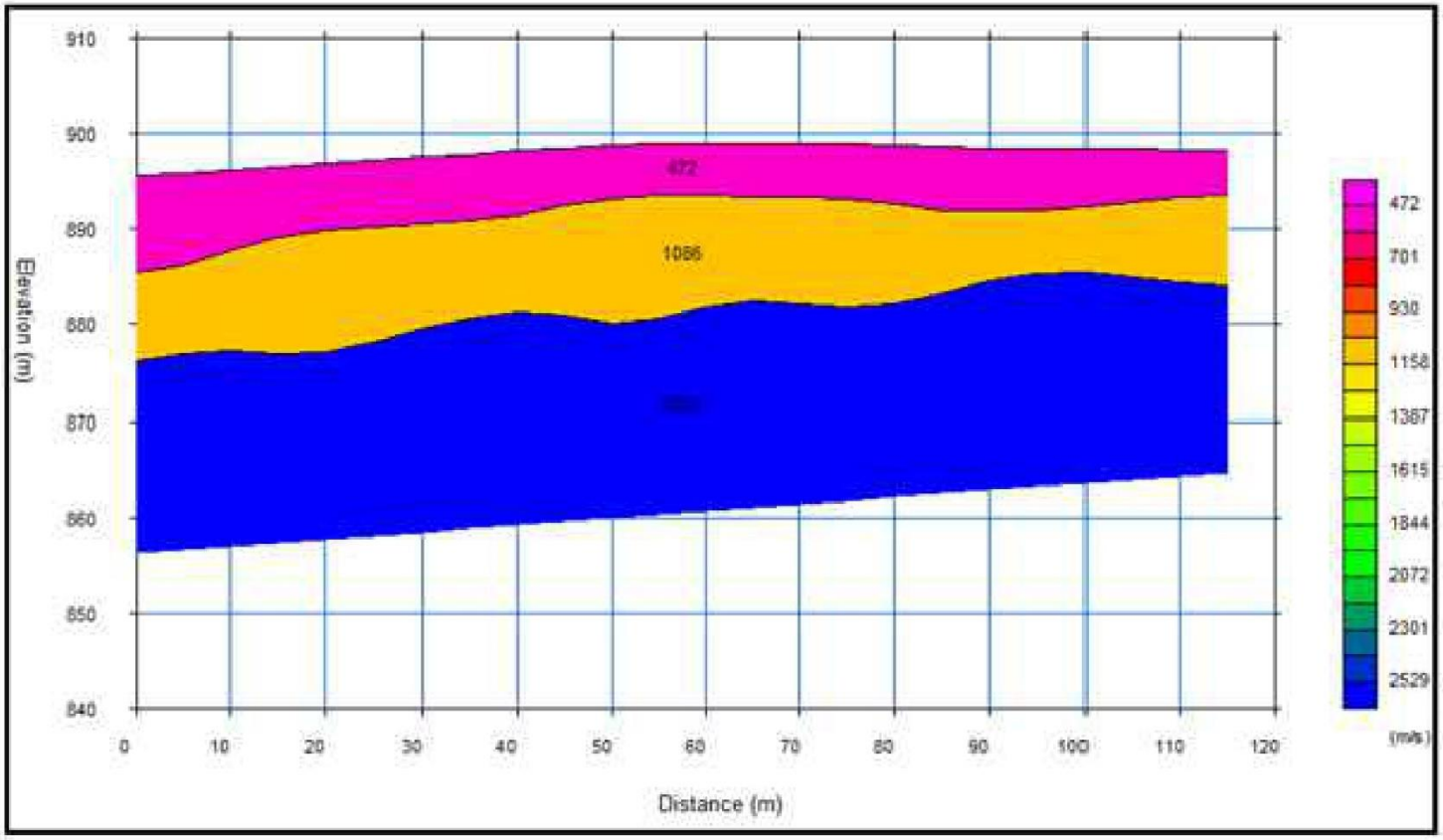

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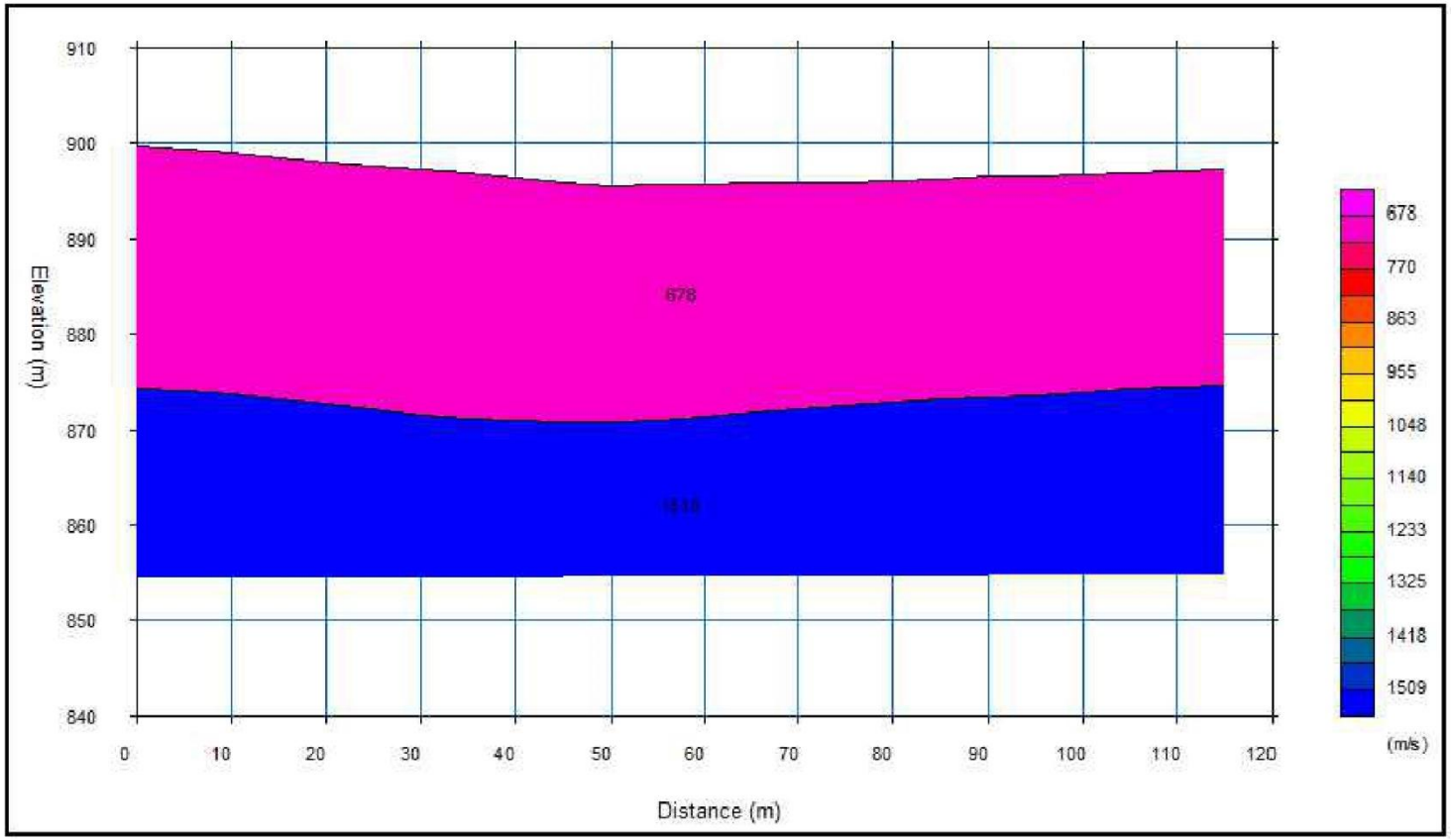
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-11B

SRT-12A -SECTION



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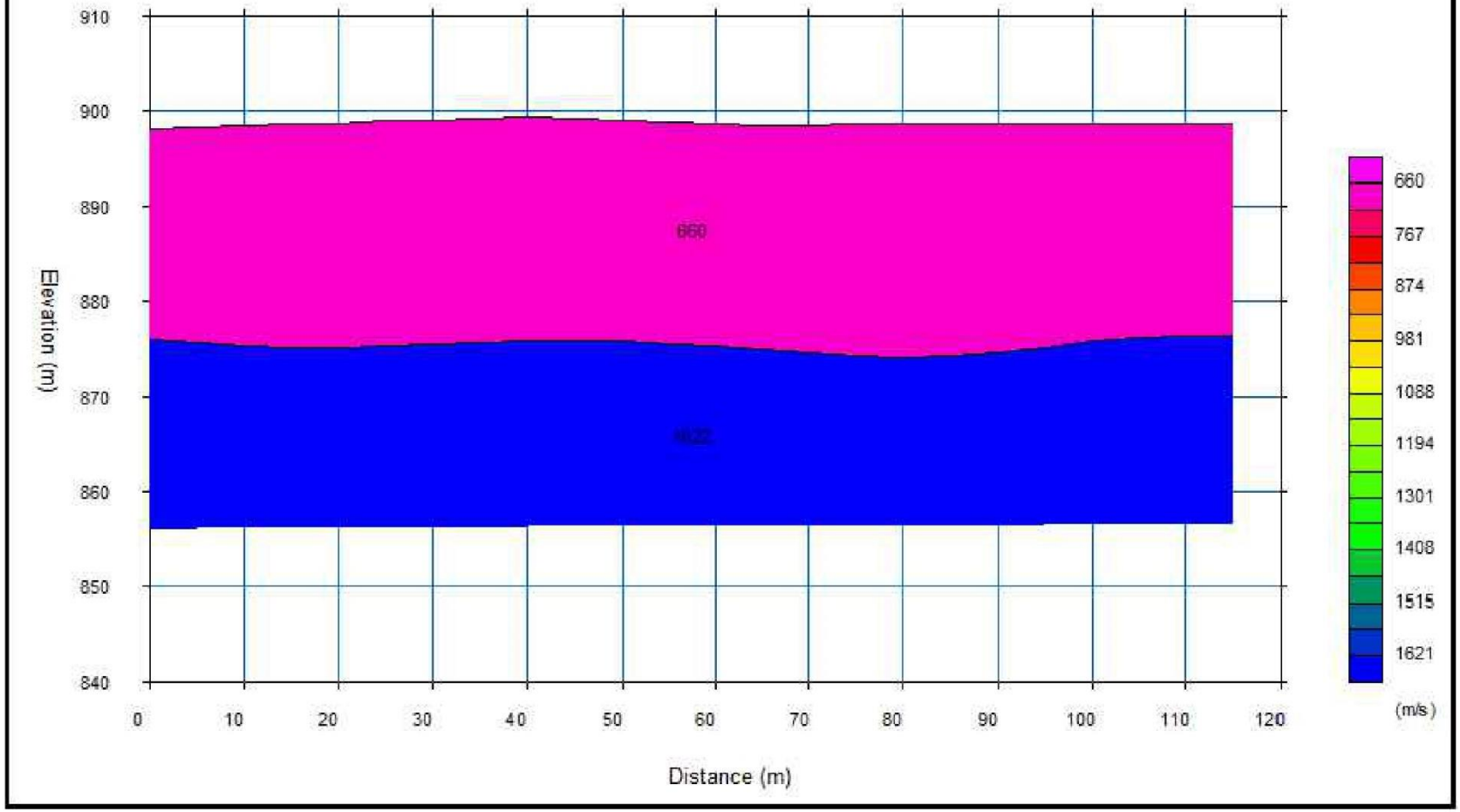

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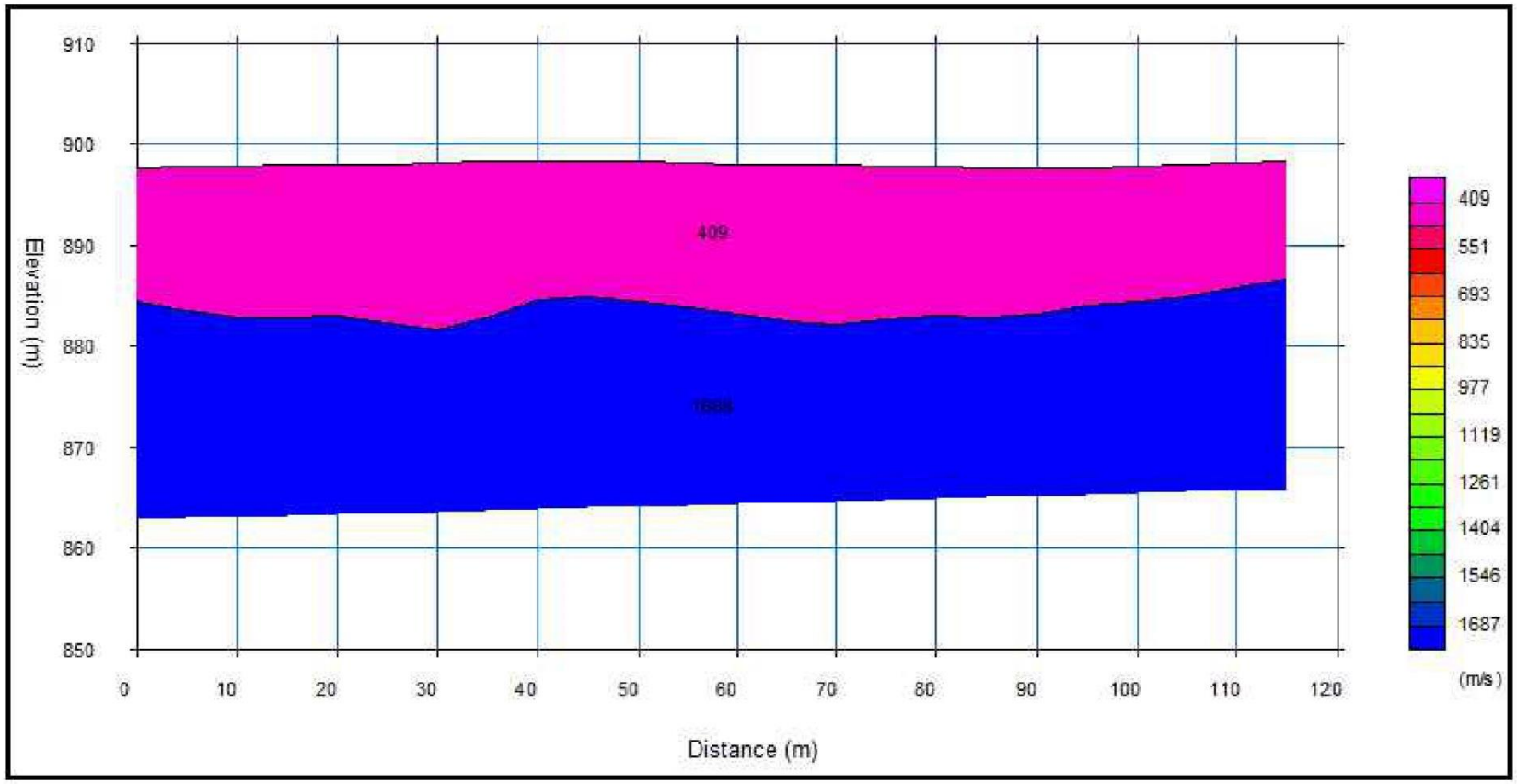
Drawing Title	SRT - SECTIONS
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-12B

SRT-13 -SECTION



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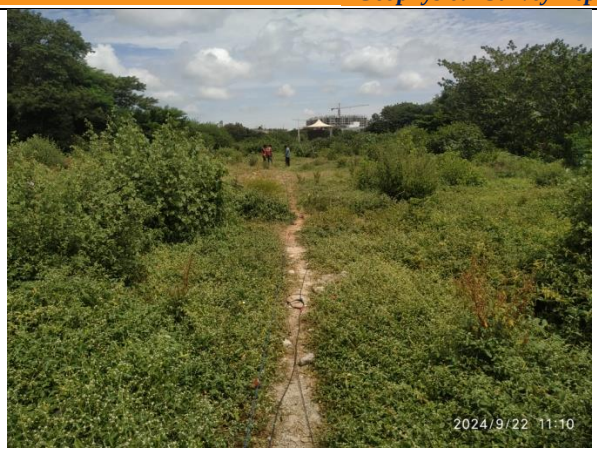
Drawing No.	RC/1640/HO/HBT/TU/DWG/ SRT-13

ANNEXURE - 3 - SITE PHOTOGRAPTHS

SRT-1	SRT-1
	Latitude: 13.04472 Longitude: 77.599243 Elevation: 925.44±6 m Accuracy: 7.6 m Time: 22-09-2024 13:08 Note: SRT INSIDE prestige site hebbal
SRT-1A	SRT-1B
Latitude: 13.04472 Longitude: 77.599243 Elevation: 925.44±6 m Accuracy: 7.6 m Time: 22-09-2024 13:08 Note: SRT INSIDE prestige site hebbal	Latitude: 13.04466 Longitude: 77.599275 Elevation: 925.74±11 m Accuracy: 6.0 m Time: 22-09-2024 13:09 Note: SRT INSIDE prestige site hebbal
SRT-1B	SRT-1B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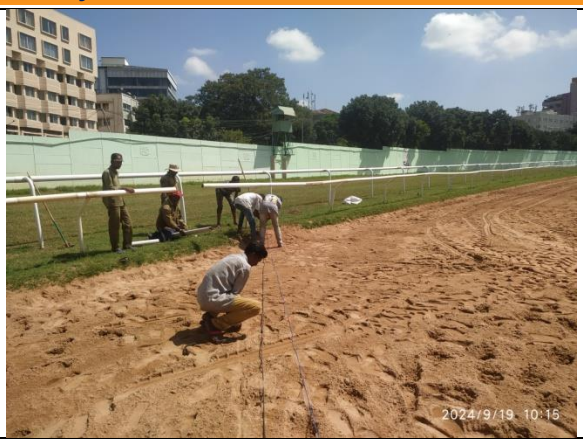
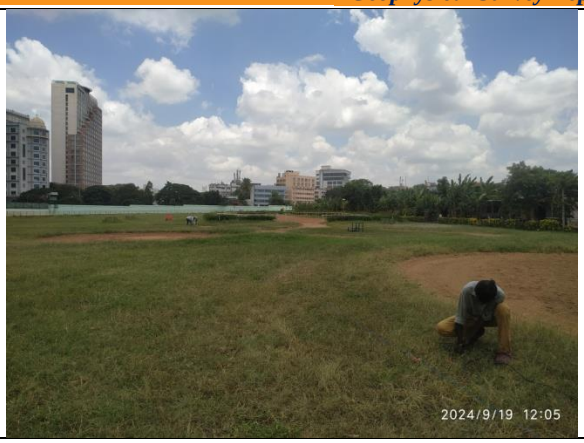
SRT-2	SRT-2
SRT-3	SRT-3
SRT-4	SRT-4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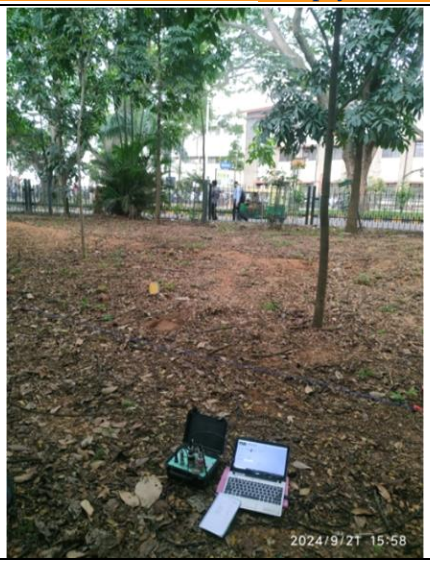
SRT-7	SRT-7
SRT-7A	SRT-7A

SRT-9



SRT-9

SRT-10

SRT-10

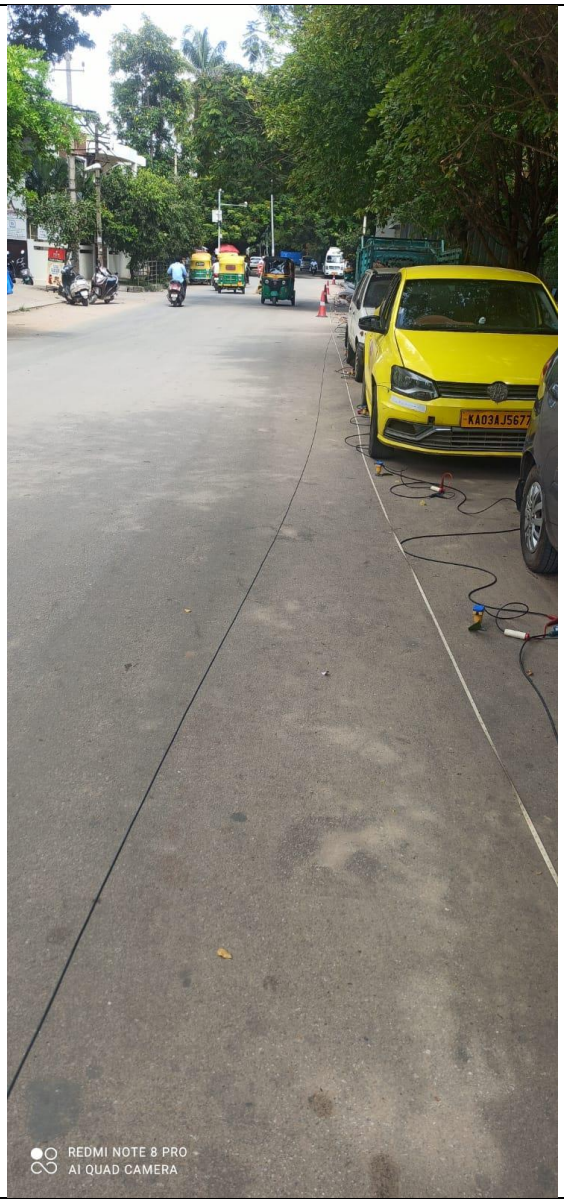
SRT-11A

SRT-11A

SRT-11B	SRT-11B
SRT-12A	SRT-12B
SRT-13	SRT-13
MASW-2	MASW-3

MASW-4

MASW-4



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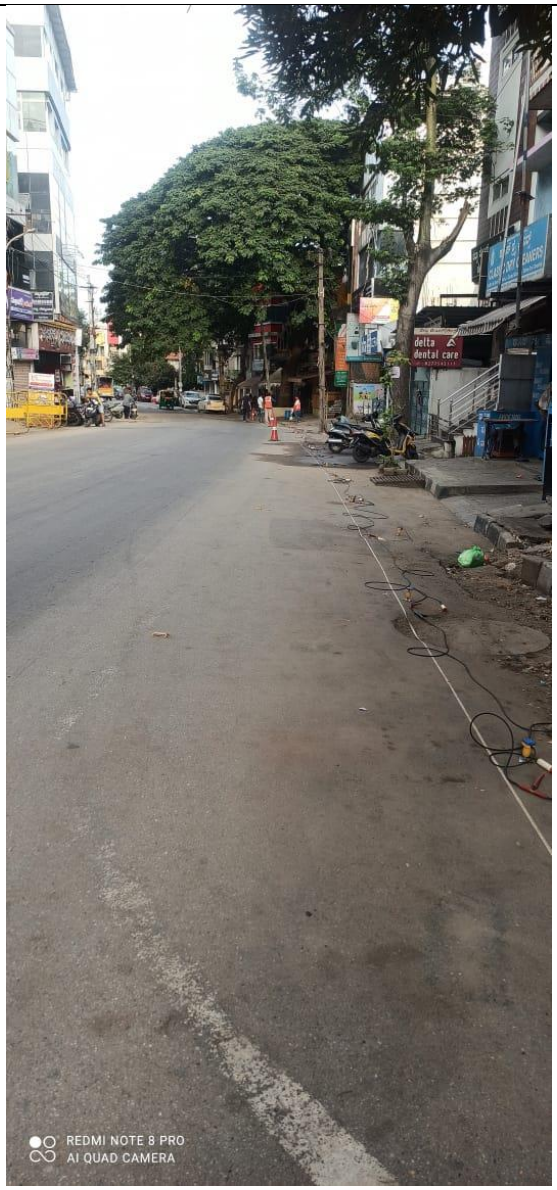

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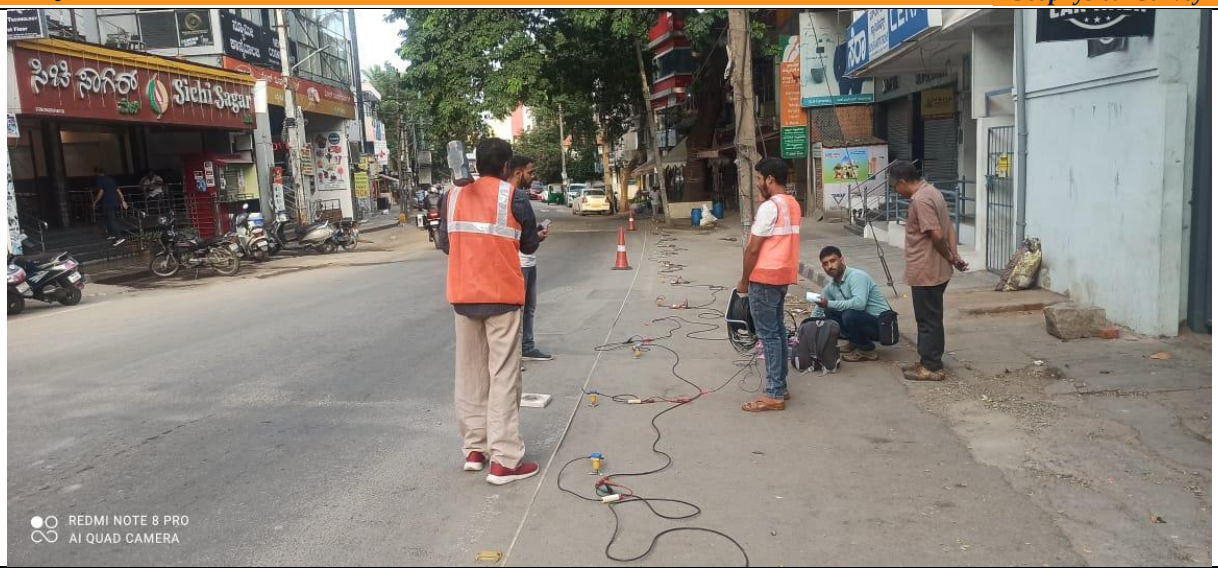

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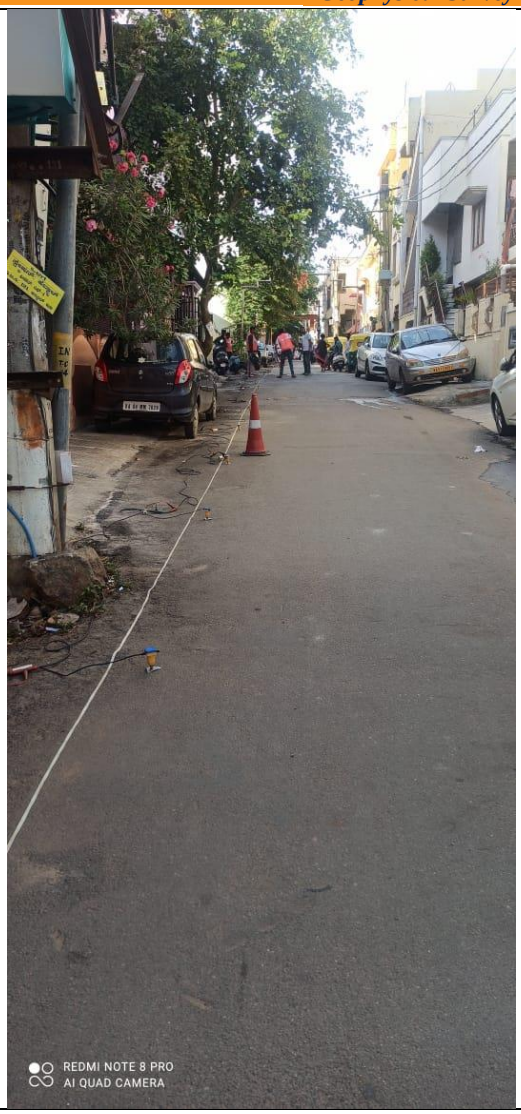
MASW-7

MASW-8

MASW-7



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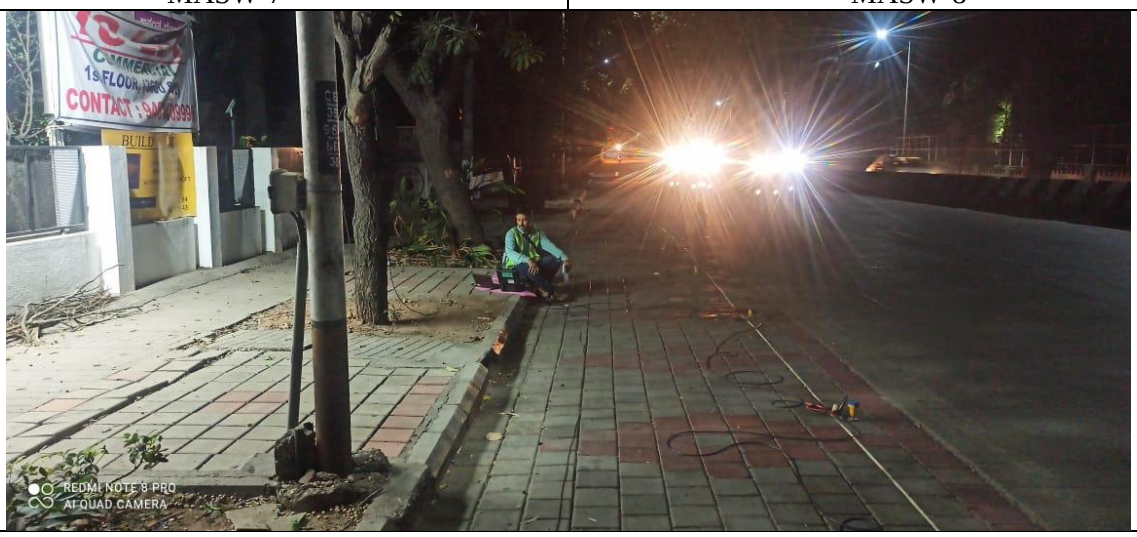

MASW-9

MASW-10

MASW-11

MASW-12

MASW-12

MASW-13

MASW-14

MASW-15

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Part-A

REPORT OF

GEOTECHNICAL ENGINEERING

INVESTIGATION FOR

CONSULTANCY SERVICES FOR PREPARATION OF DPR FOR THE WORK OF CONSTRUCTION OF UNDER GROUND VEHICULAR TUNNEL FROM HEBBAL ESTEEM MALL JUNCTION TO SILK BOARD KSRP JUNCTION

FOR

M/S. RODIC CONSULTANTS PVT LTD

MARCH-2025

Prepared By:

CIVIL LAB & GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

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Ref: CLGC/GI/24G0291
Date: March 28, 2025

Contact : **M/s. Rodic Consultants Pvt Ltd**
Tel/Mobile # :
E-mail :

Subject: **REPORT ON GEOTECHNICAL INVESTIGATION FOR CONSULTANCY SERVICES FOR PREPARATION OF DPR FOR THE WORK OF CONSTRUCTION OF UNDER GROUND VEHICULAR TUNNEL FROM HEBBAL ESTEEM MALL JUNCTION TO SILK BOARD KSRP JUNCTION**

Dear Sir,

Submitted herewith is our geotechnical investigation report for the above referenced subject. This study was performed according to your acceptance of our offer dated 10th January 2025. Total ten (10) no. of Exploratory borings drilled up to maximum depth of 30.0m to 75.0m or up to rock strata at the site are drilled to evaluate the subsurface conditions.

This report contains the results of our findings, an engineering interpretation of these with respect to the available project characteristics and recommendations to aid Preparation of DPR for the work of construction of under-ground vehicular tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

We appreciate the opportunity to be of service to you on this project. If we can be of any further assistance, or if you have any concern regarding this report, please contact our office.

Best Regards,
For Civil Lab and Geotech Consultants

Mohammed Habeeb
Authorized Signatory
Geotechnical Consultants

Project: Proposed Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction
Location: Hebbal Esteem Mall Junction to Silk Board KSRP Junction
Client: M/s. Rodic Consultants Pvt Ltd

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 Description of proposed Project Characteristics 1

2.0 PURPOSE AND SCOPE OF GEOTECHNICAL INVESTIGATION 1

2.1 Purpose of Geotechnical Investigation: 1
2.2. Scope of the Geotechnical Investigation 2
2.2.1. Field Investigations 2
2.2.2. Laboratory Testing 2
2.3. Preparation of factual Geotechnical Report 3

3.0 FIELD INVESTIGATION 3

3.1 Summary of operations 3
3.2 Description of sampling procedures 3
3.2.1 Disturbed soil Samples: 3
3.2.2 Undisturbed soil Samples: 4
3.3 Description of field test 4
3.3.1 Standard Penetration Test 4
3.4 Logs of Borings 5
3.5 Details of Boreholes location and Profile 5

4.0 LABORATORY TESTING PROGRAM 6

4.1 Lab Tests on SOIL: 6
4.2 Lab Tests on ROCK: 7

5.0 SITE & SUBSURFACE CONDITIONS 8

5.1 Site surface description 8
5.2 Subsurface material properties 8
5.3 Ground water level measurement 8

6.0 ROCK MASS CLASSIFICATION 9

6.1 Rock Mass Rating (RMR) System 9

7.0 CONCLUSION 12

8.0 LIMITATIONS OF STUDY 15

9. 0 REFERENCES 16

APPENDIX A - BORELOG DETAILS
APPENDIX A-1- GEOLOGICAL BORELOG DETAILS
APPENDIX B - LAB TEST RESULTS OF SOIL SAMPLES
APPENDIX C – DETAILED CALCULATIONS OF RMR
APPENDIX D - SOIL & ROCK PROFILE
FIG-1 - SITE WORKS AND SAMPLES PHOTOGRAPHS

1.0 INTRODUCTION

1.1 Description of proposed Project Characteristics

M/s. Rodic Consultants Pvt Ltd is preparing plans for the Proposed Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

Civil Lab and Geotech Consultants is contracted by **M/s. Rodic Consultants Pvt Ltd** to perform the geotechnical investigation at the proposed site, by executing ten (10) no. of Exploratory borings up to maximum depth of 30.0m to 75.0m or up to rock strata at the site.

Based on the information provided, the proposed project includes the Preparation of DPR for their proposed project.

2.0 PURPOSE AND SCOPE OF GEOTECHNICAL INVESTIGATION

2.1 Purpose of Geotechnical Investigation:

The purpose of this Geotechnical investigation study is to determine the general subsurface conditions by drilling ten (10) exploratory borings up to sufficient depth of 30.0m to 75.0m or up to rock strata to accommodate the proposed project.

The Purpose of Geo-Technical Investigation is to evaluate the following:

- Geotechnical investigation by Drilling boreholes.
- To ascertain the sub-soil strata for the proposed construction of this project
- To study standing Ground Water Level
- To study the physical and engineering properties of soil and rock strata
- Laboratory testing of rock and soil samples.
- Submission of detailed geotechnical report.

2.2. Scope of the Geotechnical Investigation

The Scope of Geo-technical Investigations includes the following In-situ and Laboratory Tests.

2.2.1. Field Investigations

i) Mobilization of all necessary Equipment for drilling the boreholes to the required depth in both rock and soil stratum.

ii) Drilling 10 No. boreholes 100 mm dia in soils and Nx size in rock using Calyx Operated Rotary Drilling Rig up to the sufficient depth 30.0m to 75.0m or up to the hard rock as per the Engineers instruction.

iii) Collecting Undisturbed Soil / Sand Samples as per IS: 8763 – 1978.

iv) Conducting Standard Penetration Test SPT as per IS 2131 – 1981 at every 1.5m depth or at every change of strata

v) Collecting disturbed and representative soil samples at Ground level in the Bore holes as per IS: 1892-1979.

vi) Collection of Rock Core Samples in weathered and fresh Bed Rock as per IS 4464:1985

vii) Observe the water table level in the area (through borehole)

2.2.2. Laboratory Testing

The design parameters can be obtained based on the following general laboratory Tests.

i) Grain Size Analysis as per IS: 2720 (Part 4) – 1985.

ii) Specific Gravity as per IS: 2720- (Part 3 / Section 1&2) - 1980.

iii) Atterberg Limits as per IS: 2720 (Part 5) – 1985.

iv) Determination of natural moisture content as per IS 2720 (Part 2) - 1978.

v) Determination Differential Free Swelling Index as per IS: 2720 (Part 40) – 1977

vi) Determination of Shear strength parameters By Direct Shear Tests as per IS: 2720 (part-13): 1986.

vii) Determination of Unconfined Compressive Strength of Rock Core Samples as per IS: 9143:1985.

viii) Determination of Unit Weight, Specific Gravity and Water Absorption of Rock Core Samples as per IS: 13030:1991, IS: 1124:1974

ix) Determination of Modulus of Elasticity and Poisson's Ratio of Rock in Uniaxial Compression (IS 9221)

2.3. Preparation of factual Geotechnical Report

This comprises preparing a brief soil report including soil/rock profiles, correlated physical and engineering properties of soil/rock samples based on visual soil / strata, visual classification and type of soil / rocky strata, recommendations regarding various properties of soil and rock and submission of detailed geotechnical investigation report with complete relevant data.

3.0 FIELD INVESTIGATION

The field investigation was carried out to determine the engineering characteristics of the Sub-Surface materials included a reconnaissance of the project site, drilling of exploratory borings and recovering representative soil/rock samples.

3.1 Summary of operations

The general subsurface conditions were investigated as per IS 1892:1979 (reaffirmed 2021) by drilling ten (10) exploratory borings drilled to a depth of 30.0m to 75.0m where soft rock/very strong rock strata encountered. The borehole locations were determined and established in the field by the client.

The drilling work was conducted by means of rotary drilling techniques with bentonite-water flush using Calyx rotary drilling rig.

The depths of boreholes together with the descriptions, depths of strata encountered, water table and levels at which samples were recovered are indicated in the accompanying boring log sheets (Appendix-A), along with this a Geological boring log is also attached (Appendix-A-1)

3.2 Description of sampling procedures

3.2.1 Disturbed soil Samples:

These are the samples in which the natural structure of the soil gets disturbed during sampling. However, these samples truly represent the composition and the mineral content of soil. The disturbed soil can be used to determine the index properties of soil, such as grain size, plasticity characteristics and specific gravity. Split spoon samplers are used to collect these samples. In this investigation the disturbed samples were collected during SPT test for soil classification and identification.

3.2.2 Undisturbed soil Samples:

These are the samples in which the natural structure of the soil and the water content are retained. Undisturbed samples are used for determining the engineering properties of soil, such as compressibility and shear strength. Usually, undisturbed samples of cohesive soils were collected. Shelby tubes were used to collect the undisturbed sample of cohesive soil if it encountered.

3.2.3 Sampling in Rocky stratum:

Once the hard stratum or rock surface is met the size of the borehole is reduced to NX size (76mm). The hard stratum or top of the rock surface is conformed, either by the refusal from standard penetration test N value or due to resistance during the drilling operation. In this hard stratum using NX core drilling with TC/Diamond studded bits carries out further work. The maximum length of the drill (run) maintained is 1.50m. At the end of each run the drill rod string with core barrel is extracted from the borehole and core is recovered from the core barrel. The core samples were extracted from the core barrels in a manner to prevent disturbances to the core. The cores are carefully transferred to the core boxes and preserved. The core recovery percentage is recorded and also the core pieces transferred to the core box are numbered and labelled properly. Rock Quality Designation (RQD) is also recorded. The selected core samples are sent to the laboratory for conducting physical tests.

3.3 Description of field test

The proposed project has the following field test and they described as follows:

3.3.1 Standard Penetration Test

During drilling, Standard Penetration Test (SPT) was carried out as per IS 2131: 1981 at regular depth intervals of 1.5m in order to assess the N value and relative densities of the existing soils. In this test, the number of blows required to drive a split spoon sampler with a weight 63.5 kg free falling from a height of 750mm for a total penetration distance of 450 mm in increments of 150 mm is recorded. The number of blows required to drive the split spoon sampler for the first 150mm is referred to as seating blow count and does not enter into the calculation of 'N' value. The 'N' value is the number of blows required to drive the split spoon sampler for the next 300mm (i.e., from 150 mm to 450 mm). The depths at which the Standard Penetration Tests were carried out and resulting 'N' values are given on the accompanying boring log sheets Appendix-A.

3.4 Logs of Borings

Ten (10) boreholes were drilled on the marked location. The details of complete description, thickness of all strata, locations referenced to coordinates, ground water elevation and SPT values are all mentioned in the prepared bore log, which are presented in **Appendix A.**

3.5 Details of Boreholes location and Profile

The following are details of borehole locations, respective structure, soil and rock profile and total depth of drilling.

Bore Hole No	Chainages	Co ordinates		Structure Name/ Location	Layer thickness of sub-soil stratification			Total Depth (m)
		Easting	Northing		Soil strata	Refusal strata	Rock with core recovery	
BH-03	7+700	780122.621	1437522.04	Under Ground Vehicular Tunnel Road	0.0-5.0	5.0-7.5	7.5-57.0	57.0
BH-05	1+375	780240.929	1436187.314		0.0-6.0	-	6.0-32.0	32.0
BH-08	10+700	780311.207	1434564.678		0.0-3.5	3.5-4.5	4.5-53.0	53.0
BH-09	12+050	780725.643	1433278.783		0.0-28.5	-	28.5-42.0	42.0
BH-11	12+820	780959.135	1432551.46		0.0-3.5	3.5-4.5	4.5-39.0	39.0
BH-13	13+720	781490.312	1431872.322		0.0-6.5	6.0-10.5	10.5-75.0	75.0
BH-14	14+450	782127.304	1431516.247		0.0-15.5	15.5-18.0	18.0-70.0	70.0
BH-15	14+950	782592.586	1431335.927		0.0-6.0	-	6.0-60.0	60.0
BH-16	15+980	783433.917	1430910.445		0.0-17.0	17.0-19.5	19.5-36.0	36.0
BH-17	16+380	783651.014	1430692.502		0.0-17.0	17.0-30.0	-	30.0

4.0 LABORATORY TESTING PROGRAM

In addition to the field investigation, a supplemental laboratory-testing program was conducted to determine additional pertinent engineering characteristics of the foundation materials necessary for analyzing the behavior of the proposed structure.

The laboratory testing program included relevant index and Engineering properties
The results of these selected samples obtained from all the test boring from ground level to terminated depths were analyzed and included in the **Appendix B.**

4.1 Lab Tests on SOIL:

- Moisture Content: Natural moisture content (NMC) of the soil samples was determined from the collected disturbed & undisturbed samples using Oven Drying Method, as per IS 2720-1173 (Part II) (Reaffirmed-2020).

- Atterberg Limit Test: The Atterberg Limits comprising liquid limit, plastic limit and plasticity index were determined on soil samples in accordance with the relevant methods described in IS:2720-1985 (PART-V) (Reaffirmed-2020). The liquid limit has been determined using the Casagrande apparatus method. In accordance with the Standard, soil sample preparation included removal of soil particles retained on the 425µm sieve. Accordingly, where significant quantities of coarser particles are present, it should be recognized that the Atterberg Limits results are representative of the relatively fine soil fraction, and not of the complete soil sample.

- Grain Size Distribution Analysis: Grain size distribution analysis by sieve analysis was conducted on selected samples to determine the Grain Size Distribution. The Sieve Analysis was carried out on soil samples in accordance with IS: 2720-1985 (PART-IV) (Reaffirmed-2020) by wet sieving method. Particularly in SPT samples the quantity of soil sample available for testing is typically 100 gm. This sample quantity is considered representative of soil where grain size ranges up to 4.75 mm (Coarser sand size).

- Sedimentation analysis was performed on soil samples in accordance with the hydrometer method described in IS: 2720-1985 (PART-IV) (Reaffirmed-2020). The analysis provides an estimate of the particle size distribution for the fine fraction (<75micron) of soil sample.
  The analysis was performed by monitoring the rate of settlement of soil particles initially suspended uniformly in distilled water. The rate of settlement, which is monitored by observing the change in fluid density with the hydrometer device, is related to the size of particles settling out of suspension. Hydrometer analysis was conducted to determine the percentage of Clay & Silt Fractions in Cohesive Soil Layers, as per IS: 2720-1985 (PART-IV) (Reaffirmed-2020).

- Specific Gravity of the Soil Grains was determined using Specific Gravity bottles as per IS: 2720-1980 (Part III/Sec-01) (Reaffirmed-2021). Prior to testing, samples were ground down, if necessary, so as to pass the 2mm sieve.

- Direct Shear Tests were conducted on Sandy Samples as per IS: 2720-1983 (Part XIII) (Reaffirmed-2020) by Direct shear box apparatus which was an un-drained test. Shearing force was applied by increasing the successive load until the failure takes place. The plane of shear failure was determined and the graph was plotted. Test is used to determine Shear strength parameters like Cohesion (C) and Angle Internal Friction (ϕ).

4.2 Lab Tests on ROCK:

Tests were carried out on rock cores obtained by drilling using single tube core barrel, which were necessary to be tested in the laboratory from strength consideration. The rock samples were prepared for testing in the laboratory in accordance with IS: 9179:1979. The test results so obtained were tabulated for engineering characterization of rock samples. Water absorption, Unit Weight, point load strength Index test and uniaxial compression test on the rock samples were conducted as per relevant Indian Standards.

- Unconfined Compressive Strength (UCS): Uniaxial compressive strength (Unconfined Compressive Strength) tests were carried out in accordance with the method suggested by IS: 9143 (1979).

- Point Load Test Point Load Index test were performed on selected rock specimens (in case the sample length is not sufficient for UCS Test) in accordance with the method suggested by IS: 8764 (1998) (Reaffirmed-2019).

- Unit Weight, Specific Gravity, Absorption & Porosity: Unit Weight, Specific Gravity, Absorption & Porosity of the rock samples were determined for the selected core samples as per IS: 13030-1991 (Reaffirmed-2021).

- Water Absorption –IS 1124-1974 (Reaffirmed-2017)

- Determination of modulus of elasticity & Poisson's ratio of rock material in Uniaxial Compression (IS 9221).

5.0 SITE & SUBSURFACE CONDITIONS

5.1 Site surface description

In general, the explored locations are having natural deposit of soil and soft rock/strong rock. this soil deposit is having loose to very dense in condition. after this depth very dense completely weathered disintegrated soft rock has encountered, after the soft rock the rock having completely weathered to fresh in nature and weak to very strong in strength has encountered. we have carried out exploratory drilling work at ten bore holes to a depth of 30.0m to 75.0m or up to hard strata/rock strata.

5.2 Subsurface material properties

The soil conditions encountered in the test borings are described briefly in the following paragraphs. The soil boring logs should be referred for more detailed description of soil condition in the test borings. The letters in parenthesis after the soil description on the boring logs in the appendix are the soil classification in accordance with the Indian Standard Classification System (IS 1498: 1970).

Ten test borings were drilled at the site to disclosed granular materials, the soil classified as Silty SAND and Sandy SILT description made from soil sample collected at the site.

Based on the SPT N values the investigated soil is described as loose to very dense in condition and soft rock to strong rock till the drilled depth of the borehole.

The rock encountered from the surface itself has disintegrated soft rock where no core is recovered to the rock having TCR of 4% to 100% this is present in the boreholes. The rock encountered has completely weathered to fresh in nature and has weak to very strong in strength.

5.3 Ground water level measurement

Ground Water level observations were made after the completion of the drilling operations by 24 hours. **Ground water was encountered at a varying depth of 2.0m to 15.0m depth in various boreholes at the time of investigation.** The depth of ground water level of each borehole is mentioned in Appendix-A**.** In relatively pervious soils such as sandy soils, the indicated elevation is considered reliable groundwater level. Seasonal variations, temperature, recent rainfall may influence the groundwater table, and movement of water will depend on the permeability of the soils.

6.0 ROCK MASS CLASSIFICATION

6.1 Rock Mass Rating (RMR) System

The rock mass rating should be determined as an algebraic sum of ratings for all the parameters given in Items I to VI described below, after adjustments for orientation of discontinuities. The sum of the six parameters is the 'RMR value', which lies between 0 and 100. The code followed for RMR calculation is IS 13365-1 (1998). The detailed RMR were analyzed and included in the **Appendix C.**

Rock mass rating of the tunneling media can be computed by considering the following six parameters:

1. Uniaxial compressive strength of the intact rock
2. Rock Quality Designation (RQD).
3. Spacing of rock discontinuities
4. Condition of discontinuities
5. Ground water conditions
6. Orientation of discontinuities

1. **Uniaxial Compressive Strength of the intact rock**- is a mechanical property of rocks widely used in different engineering related projects to evaluate the stability of structures against loads. The strength of the intact rock material should be obtained from rock cores in accordance with IS 9143 or IS 8764 or IS 10785 as applicable based on-site conditions. The ratings based on uniaxial compressive strength and point load strength.
2. **Rock Quality Designation (RQD)** – is a modified percent core recovery which incorporates only sound core pieces of length that are 100 mm or more. It has also been recommended by Barton et.al. that an arbitrary value of 10 may be provided where RQD becomes) 0 or less than 10.
   RQD = (($Sum\ of\ core\ pieces\ length$ > 10 cm)/ $Total\ drill\ run$) X100
3. **Spacing of Rock Discontinuities** - The term discontinuity covers joints, beddings or foliations. shear zones, minor faults, or other surfaces of weakness. The linear distance between two adjacent discontinuities should be measured for all sets of discontinuities.
4. **Condition of Discontinuities** - This parameter includes roughness of discontinuity surfaces, their separation, length or continuity, weathering of the wall rock or the planes of weakness and infilling (gauge) material.

5. **Ground Water Conditions** - In case of tunnels, the rate of inflow of ground water in liter per minute per 10m length of the tunnel should be determined, or a general condition can be described as completely dry, damp, wet, dripping, and flowing
   Rating of above five parameters is added to obtain what is called the basic rock mass rating (RMR basic).

6. **Orientation of Discontinuities** - Orientation of discontinuities means the strike and dip of discontinuities. The strike should be recorded with reference to magnetic north. The dip angle is the angle between the horizontal and the discontinuity plane taken in a direction in which the plane dips. In addition, the orientation of tunnel axis or slope face or foundation alignment should also be recorded. Once favorability of critical discontinuity is known, adjustment for orientation of discontinuities is applied to earlier obtained basic rock mass rating to obtain RMR.

The range of RMR Rating for all the six parameters are

SL No	Parameters	RMR Rating	
		Minimum	Maximum
1	Uniaxial Compressive Strength of the intact rock	0	15
2	Rock Quality Designation (RQD)	3	20
3	Spacing of Rock Discontinuities	5	20
4	Condition of Discontinuities	0	30
5	Ground Water Conditions	0	15
6	Orientation of Discontinuities		
	6.1 Tunnels	0	-12
	6.2 Foundations	0	-25
	6.3 Slopes	0	-50

On the basis of RMR values for a given engineering structure, the rock mass should be classified as shown in Table Below.

Range of Rock	Class of Rock	Category
81-100	I	Very Good
61-80	II	Good
41-60	III	Fair
21-40	IV	Poor
0-20	V	Very Poor

Considering all the above criteria for determination Rock Mass Rating (RMR) of a rock, RMR of selected samples obtained from all the test boring from ground level to up to the terminated depths of all the boreholes are estimated and tabulated in table below. The detailed RMR were analyzed, calculated and included in the **Appendix C**.

SL No	BH No	Range of RMR	Class of RMR	Category
01	BH-03	19 to 82	V to I	Very Poor to Very Good
02	BH-05	25 to 77	IV to II	Poor to Good
03	BH-08	20 to 82	V to I	Very Poor to Very Good
04	BH-09	17 to 72	V to II	Very Poor to Good
05	BH-11	20 to 77	V to II	Very Poor to Good
06	BH-13	40 to 82	IV to I	Poor to Very Good
07	BH-14	53 to 82	III to I	Fair to Very Good
08	BH-15	7 to 74	V to II	Very Poor to Good
09	BH-16	17 to 61	V to II	Very Poor to Good
10	BH-17	-	-	-

7.0 CONCLUSION

The report enumerates the factual data obtained from field records through a geotechnical investigation carried out at site. The data presented in this report specific for the boreholes drilled and time at which tests performed, it may be varied after physical checking of core boxes of boreholes drilled. Finally, it should be noted that the geotechnical data report is solely based on the drilled boreholes and field/laboratory tests that conducted, assuming that the subsurface conditions do not significantly deviate from those encountered.

In BH-03, the sub-surface condition is medium dense to very dense soil obtained from surface to 5.0m depth then very dense completely weathered disintegrated soft rock obtained from 5.0m to 7.5m and then a highly weathered weak rock to fresh very strong rock encountered from 7.5m to up to the drilled depth of 57.0m.

1. TCR ranges from-28% to 100%
2. RQD ranges from- 0% to 100%
3. UCS ranges from- 9.99 N/mm² to 120.56 N/mm²
4. RMR ranges from-19 to 82 (class -V to class -I)
5. Modulus of elasticity “E” ranges from-67145 MPa to 71053 MPa
6. Poisson ratio ranges from- 0.18 to 0.19

In BH-05, the sub-surface condition is medium dense to very dense soil obtained from surface to 6.0m depth and then a moderately weathered strong rock to fresh very strong rock encountered from 6.0m to up to the drilled depth of 32.0m.

1. TCR ranges from-25% to 100%
2. RQD ranges from- 0% to 100%
3. UCS ranges from- 50.42 N/mm² to 109.16 N/mm²
4. RMR ranges from-25 to 77 (class -IV to class -II)
5. Modulus of elasticity “E” ranges from- 28220 MPa to 32004 MPa
6. Poisson ratio ranges from- 0.19 to 0.23

In BH-08, the sub-surface condition is medium dense to dense soil obtained from surface to 3.5m depth then very dense completely weathered disintegrated soft rock obtained from 3.5m to 4.5m and then a moderately weathered weak rock to fresh very strong rock encountered from 4.5m to up to the drilled depth of 53.0m.

1. TCR ranges from-29% to 100%
2. RQD ranges from- 9% to 100%
3. UCS ranges from- 14.03 N/mm² to 121.44 N/mm²
4. RMR ranges from-20 to 82 (class -V to class -I)
5. Modulus of elasticity “E” ranges from- 67241 MPa to 71368 MPa
6. Poisson ratio ranges from- 0.16 to 0.18

In BH-09, the sub-surface condition is medium dense to very dense soil obtained from surface to 28.5m and then a highly weathered weak rock to fresh strong rock encountered from 28.5m to up to the drilled depth of 42.0m.

1. TCR ranges from-28% to 100%
2. RQD ranges from- 0% to 100%
3. UCS ranges from- 7.26 N/mm² to 81.98 N/mm²
4. RMR ranges from-17 to 72 (class -V to class -II)
5. Modulus of elasticity "E" ranges from- 58812 MPa to 63249 MPa
6. Poisson ratio ranges from- 0.21 to 0.24

In BH-11, the sub-surface condition is loose to very dense soil obtained from surface to 3.5m then very dense completely weathered disintegrated soft rock obtained from 3.5m to 4.5m and then a highly weathered weak rock to fresh very strong rock encountered from 4.5m to up to the drilled depth of 39.0m.

1. TCR ranges from-21% to 100%
2. RQD ranges from- 9% to 100%
3. UCS ranges from- 5.94 N/mm² to 117.49 N/mm²
4. RMR ranges from-20 to 77 (class -V to class -II)
5. Modulus of elasticity "E" ranges from- 53221 MPa to 60025 MPa
6. Poisson ratio ranges from- 0.17 to 0.19

In BH-13, the sub-surface condition is medium dense to very dense soil obtained from surface to 6.5m then very dense completely weathered disintegrated soft rock obtained from 6.5m to 10.5m and then a moderately weathered weak rock to fresh very strong rock encountered from 10.5m to up to the drilled depth of 75.0m.

1. TCR ranges from-57% to 100%
2. RQD ranges from- 50% to 100%
3. UCS ranges from- 15.53 N/mm² to 128.89 N/mm²
4. RMR ranges from-40 to 82 (class -IV to class -I)
5. Modulus of elasticity "E" ranges from- 68013 MPa to 80060 MPa
6. Poisson ratio ranges from- 0.16 to 0.19

In BH-14, the sub-surface condition is medium dense to very dense soil obtained from surface to 15.5m then very dense completely weathered disintegrated soft rock obtained from 15.5m to 18.0m and then a moderately weathered medium strong rock to fresh very strong rock encountered from 18.0m to up to the drilled depth of 70.0m.

1. TCR ranges from-17% to 100%
2. RQD ranges from- 0% to 100%
3. UCS ranges from- 25.43 N/mm² to 124.50 N/mm²
4. RMR ranges from-53 to 82 (class -III to class -I)
5. Modulus of elasticity "E" ranges from- 66082 MPa to 73138 MPa
6. Poisson ratio ranges from- 0.20 to 0.24

In BH-15, the sub-surface condition is medium dense to very dense soil obtained from surface to 6.0m and then a moderately weathered weak rock to fresh very strong rock encountered from 6.0m to up to the drilled depth of 60.0m.

1. TCR ranges from- 4% to 100%
2. RQD ranges from- 0% to 100%
3. UCS ranges from- 6.01 N/mm² to 127.06 N/mm²
4. RMR ranges from- 7 to 74 (class -V to class -II)
5. Modulus of elasticity "E" ranges from- 73191 MPa to 75248 MPa
6. Poisson ratio in the range of - 0.19

In BH-16, the sub-surface condition is medium dense to very dense soil obtained from surface to 17.0m then very dense completely weathered disintegrated soft rock obtained from 17.0m to 19.5m and then a highly weathered weak rock to fresh strong rock encountered from 19.5m to up to the drilled depth of 36.0m.

1. TCR ranges from- 21% to 78%
2. RQD ranges from- 0% to 78%
3. UCS ranges from- 5.01 N/mm² to 54.36 N/mm²
4. RMR ranges from- 17 to 61 (class -V to class -II)
5. Modulus of elasticity "E" ranges from- 28512 MPa to 31479 MPa
6. Poisson ratio ranges from- 0.19 to 0.23

In BH-17, the sub-surface condition is medium dense to very dense soil obtained from surface to 17.0m and then very dense completely weathered disintegrated soft rock obtained from 17.0m to up to the drilled depth of 30.0m.

1. TCR ranges from- 0% to 0%
2. RQD ranges from- 0% to 0%
3. Modulus of elasticity "E" in the range of – 124 MPa
4. Poisson ratio in the range of – 0.30

8.0 LIMITATIONS OF STUDY

Differing Conditions

Our recommendations for this project were developed utilizing soils/rock information obtained from the test borings that were made at the proposed site. At this time, we would like to point out that soil/rock test borings only depict the soil/rock conditions at the specific locations and time at which they were made. The soil conditions at other locations on the site may differ from those occurring at the boring locations. If deviations from the noted subsurface conditions are encountered during construction, they should be brought to the attention of the geotechnical engineer.

Changes in Plans

The conclusion and recommendations herein have been based upon the available soil information and the preliminary design details furnished by a representative of the client of the proposed project and/or as assumed herein. Any revision in the plans for the proposed construction from those anticipated in this report should be brought to the attention of the geotechnical engineer to determine whether any changes in the foundation or earthwork recommendations are necessary.

Report Interpretation

Civil Lab and Geotech Consultants is not responsible for the conclusions, opinions, or recommendations made by others based upon the data included herein. It is the client's responsibility to seek any guidance and clarifications from our geotechnical engineer needed for proper interpretation of this report.

We hope the information provided herein will satisfy your requirements. We appreciate the opportunity to be of continued service to you in this regard. Please feel free to contact our office should you have any questions.

Yours sincerely,
FOR CIVIL LAB AND GEOTECH CONSULTANTS

MOHAMMED HABEEB
Authorized signatory

9. 0 REFERENCES

1. IS 1892: 1985 Code of practice for subsurface investigation of Foundation
2. IS 1498: 1970 Classification and Identification of soils for Gen. Eng. Purpose
3. IS 2131: 1981 Method of Standard Penetration test for soils
4. IS 2132: 1981 Code of practice for thin-walled tube sampling of soil.
5. IS 6926 - Code of Practice for Diamond Core Drilling for site investigation for river valley projects.
6. IS 4078 - Code of Practice for Indexing & storage of drill cores.
7. IS 5313: 1985 Guide for core drilling observation
8. IS 4464: 1985 Code and practice for presentation of drilling information and core description in foundation Investigation
9. IS 6403: 1981 Code for Determination of Bearing capacity of shallow foundation.
10. IS 8009:1976 Code of practice for calculation of settlement of foundation.
11. IS 12070:1987 Code and practice for design and construction of foundation on Rock.
12. IS 9179- Code of Practice for Method for preparation of rock specimen for laboratory testing.
13. IS 9143- Code of Practice for Method for determination of unconfined compressive strength of rock materials.
14. IS 9221- Code of Practice for Method for determination of modulus of elasticity & Poisson's ratio of rock material in Uniaxial Compression.
15. IS:13030-1991 - Method of Test for Laboratory Determination of Water Content, Porosity, Density and Related Properties of Rock Material.
16. IS:8764-1998 - Method for Determination of Point Load Strength Index of Rocks
17. ISRM - International Society of Rock Mechanics.
18. IS:13365 (Part-I)-1998 - Quantitative Classification Systems of Rock Mass – Guidelines
19. Foundation Analysis and Design by Bowels.

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APPENDIX-A

BORELOG DETAILS

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APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**			Report No.	**24G0291**	Boring No.	**BH- 03**
Location:	**Golf Course, Bengaluru.**			Elevation (m):	**0.0**	Starting date:	**15.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**			Boring Depth (m)	**57.00**	Ending date:	**25.02.2025**
Method of boring:	**Mechanical Rotary Drilling**			Coordinates		Northing	1437522.040
Ground water depth(m) :	**15.00**					Easting	780122.621

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		**15**	**30**	**45**				**TCR (%)**	**RQD (%)**
0.5									
1.0									
	SPT 1	4	7	9	**16**	Medium Dense Brownish Yellow Silty SAND			
1.5									
2.0									
2.5									
	SPT 2	5	8	12	**20**	Medium Dense Whitish Yellow Silty SAND			
3.0									
3.5									
4.0									
4.5	SPT 3	50/ 13cm	R	R	**R**	Very Dense Whitish Yellow Silty SAND			
5.0									
5.5									
	SPT 4	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
6.0									
6.5									
7.0									
	SPT 5	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
7.5									
8.0									
8.5	RUN 1	-	-	-	**-**	Highly Weathered Brownish White Weak Rock		28%	Nill
9.0									
9.5									
10.0	RUN 2	-	-	-	**-**	Highly Weathered Brownish White Weak Rock		29%	22%

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APPENDIX-A

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Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1437522.040
Ground water depth(m) :	**15.00**			Easting	780122.621

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5						Weak Rock			
11.0									
11.5	RUN 3	-	-	-	-	Highly Weathered Brownish White Weak Rock		31%	22%
12.0									
12.5									
13.0	RUN 4	-	-	-	-	Highly Weathered Brownish White Medium Strong Rock		21%	21%
13.5									
14.0									
14.5	RUN 5	-	-	-	-	Highly Weathered Brownish White Medium Strong Rock		35%	30%
15.0									
15.5									
16.0	RUN 6	-	-	-	-	Highly Weathered Brownish White Medium Strong Rock		19%	12%
16.5									
17.0									
17.5	RUN 7	-	-	-	-	Highly Weathered Brownish White Medium Strong Rock		29%	12%
18.0									
18.5									
19.0	RUN 8	-	-	-	-	Fresh Greyish White Strong Rock		59%	59%
19.5									
20.0									
20.5	RUN 9	-	-	-	-	Fresh Greyish White Strong Rock		32%	32%
21.0									
21.5									
22.0	RUN 10	-	-	-	-	Fresh Greyish White Strong Rock		49%	49%
22.5									
23.0									
23.5	RUN 11	-	-	-	-	Highly Weathered Greyish White Strong Rock		38%	31%
24.0									
24.5									
25.0	RUN 12	-	-	-	-	Fresh Greyish White Strong Rock		49%	49%
25.5									
26.0									
26.5	RUN 13	-	-	-	-	Fresh Greyish White Strong Rock		77%	60%
27.0									
27.5									
28.0	RUN 14	-	-	-	-	Fresh Greyish White Strong Rock		40%	25%
28.5									
29.0									
29.5	RUN 15	-	-	-	-	Fresh Greyish White Strong Rock		79%	73%

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E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 03**
Location:	**Golf Course, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**15.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**57.00**	Ending date:	**25.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1437522.040
Ground water depth(m) :	**15.00**			Easting	780122.621

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
30.0									
30.5									
31.0	RUN 16	-	-	-	-	Fresh Greyish White Strong Rock		74%	74%
31.5									
32.0									
32.5	RUN 17	-	-	-	-	Fresh Greyish White Strong Rock		90%	90%
33.0									
33.5									
34.0	RUN 18	-	-	-	-	Fresh Greyish White Very Strong Rock		93%	93%
34.5									
35.0									
35.5	RUN 19	-	-	-	-	Fresh Greyish White Very Strong Rock		92%	90%
36.0									
36.5									
37.0	RUN 20	-	-	-	-	Fresh Greyish White Very Strong Rock		97%	97%
37.5									
38.0									
38.5	RUN 21	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
39.0									
39.5									
40.0	RUN 22	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
40.5									
41.0									
41.5	RUN 23	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
42.0									
42.5									
43.0	RUN 24	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
43.5									
44.0									
44.5	RUN 25	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
45.0									
45.5									
46.0	RUN 26	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
46.5									
47.0									
47.5	RUN 27	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
48.0									
48.5									
49.0	RUN 28	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%

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E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**		Report No.	**24G0291**	Boring No.	**BH- 03**
Location:	**Golf Course, Bengaluru.**		Elevation (m):	**0.0**	Starting date:	**15.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**		Boring Depth (m)	**57.00**	Ending date:	**25.02.2025**
Method of boring:	**Mechanical Rotary Drilling**		Coordinates		Northing	1437522.040
Ground water depth(m) :	**15.00**				Easting	780122.621

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
49.5						Rock			
50.0									
50.5	RUN 29	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
51.0									
51.5									
52.0	RUN 30	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
52.5									
53.0									
53.5	RUN 31	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
54.0									
54.5									
55.0	RUN 32	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
55.5									
56.0									
56.5	RUN 33	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
57.0									

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 57.0 Meters.	RUN / Rock Coring
DS	Disturbed sample		GWL / Ground water level
SPT	Standard penetration test		Logged by / AA
R	Refusal- N value >50		Checked by / MH

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APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 05**
Location:	**Freedom Park, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**27.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**32.00**	Ending date:	**07.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1436187.314
Ground water depth(m) :	**10.0**			Easting	780240.929

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		**15**	**30**	**45**				**TCR (%)**	**RQD (%)**
0.5 1.0 1.5 2.0	SPT 1	5	3	8	**11**	Medium Dense Brownish Silty SAND			
2.5 3.0 3.5	SPT 2	15	17	22	**39**	Dense Brownish Silty SAND			
4.0 4.5 5.0	SPT 3	50/ 10cm	R	R	**R**	Very Dense Yellowish Grey Silty SAND			
5.5 6.0	SPT 4	50/ 9cm	R	R	**R**	Very Dense Greyish Silty SAND			
6.5 7.0 7.5	RUN 1	-	-	-	**-**	Moderately Weathered Brownish White Strong Rock		47%	47%
8.0 8.5 9.0	RUN 2	-	-	-	**-**	Moderately Weathered Brownish White Strong Rock		45%	45%
9.5 10.0	RUN 3	-	-	-	**-**	Highly Weathered Brownish White Strong Rock		25%	Nill

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 05**
Location:	**Freedom Park, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**27.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**32.00**	Ending date:	**07.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1436187.314
Ground water depth(m) :	**10.0**			Easting	780240.929

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5						~~Strong Rock~~			
11.0									
11.5	RUN 4	-	-	-	-	Moderately Weathered Brownish White Strong Rock		33%	8%
12.0									
12.5									
13.0	RUN 5	-	-	-	-	Moderately Weathered Brownish White Strong Rock		45%	45%
13.5									
14.0									
14.5	RUN 6	-	-	-	-	Moderately Weathered Brownish White Strong Rock		49%	49%
15.0									
15.5									
16.0	RUN 7	-	-	-	-	Moderately Weathered Brownish White Strong Rock		32%	31%
16.5									
17.0									
17.5	RUN 8	-	-	-	-	Moderately Weathered Brownish White Strong Rock		48%	48%
18.0									
18.5									
19.0	RUN 9	-	-	-	-	Slightly Weathered Brownish White Strong Rock		46%	46%
19.5									
20.0									
20.5	RUN 10	-	-	-	-	Slightly Weathered Yellowish White Strong Rock		55%	43%
21.0									
21.5									
22.0	RUN 11	-	-	-	-	Slightly Weathered Yellowish White Strong Rock		65%	59%
22.5									
23.0									
23.5	RUN 12	-	-	-	-	Slightly Weathred Yellowish White Strong Rock		85%	78%
24.0									
24.5									
25.0	RUN 13	-	-	-	-	Slightly Weathred Yellowish White Strong Rock		89%	88%
25.5									
26.0									
26.5	RUN 14	-	-	-	-	Slightly Weathred Yellowish White Strong Rock		87%	87%
27.0									
27.5									
28.0	RUN 15	-	-	-	-	Slightly Weathred Yellowish White Very Strong Rock		88%	88%
28.5									

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APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 05**
Location:	**Freedom Park, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**27.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**32.00**	Ending date:	**07.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1436187.314
Ground water depth(m) :	**10.0**			Easting	780240.929

Depth (m)	**Sample No.**	**SPT Blows/15cm**			**"N" value**	**Description of Strata**	**Legend**	**Total core recovery**	**Rock Quality Designation**
0.0		**15**	**30**	**45**				**TCR (%)**	**RQD (%)**
29.0 29.5 30.0	RUN 16	-	-	-	**-**	Fresh Greyish White Very Strong Rock		91%	87%
30.5 31.0 31.5	RUN 17	-	-	-	**-**	Fresh Greyish White Very Strong Rock		90%	90%
32.0	RUN 18	-	-	-	**-**	Fresh Greyish White Very Strong Rock		100%	100%

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 32.0 Meters.		RUN	Rock Coring
DS	Disturbed sample			GWL	Ground water level
SPT	Standard penetration test			Logged by	AA
R	Refusal- N value >50			Checked by	MH

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 08**
Location:	**Silver Jubilee Park, K R Market, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**19.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**53.00**	Ending date:	**27.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1434564.678
Ground water depth(m) :	**2.00**			Easting	780311.207

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5 1.0 1.5 2.0 2.5	SPT 1	8	10	13	**23**	Medium Dense Brownish Silty SAND			
3.0 3.5	SPT 2	11	15	17	**32**	Dense Greyish Silty SAND			
4.0 4.5	SPT 3	50/ 3cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
5.0 5.5 6.0	RUN 1	-	-	-	**-**	Moderately Weathered Whitish Brown Weak Rock		29%	9%
6.5 7.0 7.5	RUN 2	-	-	-	**-**	Slightly Weathered Whitish Grey Medium Strong Rock		71%	46%
8.0 8.5 9.0	RUN 3	-	-	-	**-**	Slightly Weathered Whitish Grey Medium Strong Rock		90%	90%
9.5 10.0	RUN 4	-	-	-	**-**	Slightly Weathered Whitish Grey Medium Strong Rock		58%	58%

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 08**
Location:	**Silver Jubilee Park, K R Market, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**19.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**53.00**	Ending date:	**27.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1434564.678
Ground water depth(m) :	**2.00**			Easting	780311.207

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5									
11.0									
11.5	RUN 5	-	-	-	-	Slightly Weathered Whitish Grey Strong Rock		83%	83%
12.0									
12.5									
13.0	RUN 6	-	-	-	-	Slightly Weathered Whitish Grey Strong Rock		75%	75%
13.5									
14.0									
14.5	RUN 7	-	-	-	-	Slightly Weathered Whitish Grey Strong Rock		73%	73%
15.0									
15.5									
16.0	RUN 8	-	-	-	-	Fresh Whitish Grey Strong Rock		81%	81%
16.5									
17.0									
17.5	RUN 9	-	-	-	-	Fresh Whitish Grey Strong Rock		89%	89%
18.0									
18.5									
19.0	RUN 10	-	-	-	-	Fresh Whitish Grey Very Strong Rock		98%	98%
19.5									
20.0									
20.5	RUN 11	-	-	-	-	Fresh Whitish Grey Very Strong Rock		93%	88%
21.0									
21.5									
22.0	RUN 12	-	-	-	-	Fresh Whitish Grey Very Strong Rock		91%	91%
22.5									

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 08**
Location:	**Silver Jubilee Park, K R Market, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**19.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**53.00**	Ending date:	**27.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1434564.678
Ground water depth(m) :	**2.00**			Easting	780311.207

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
23.0									
23.5	RUN 13	-	-	-	-	Fresh Whitish Grey Very Strong Rock		99%	99%
24.0									
24.5									
25.0	RUN 14	-	-	-	-	Fresh Whitish Grey Very Strong Rock		97%	97%
25.5									
26.0									
26.5	RUN 15	-	-	-	-	Fresh Whitish Grey Very Strong Rock		99%	99%
27.0									
27.5									
28.0	RUN 16	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
28.5									
29.0									
29.5	RUN 17	-	-	-	-	Fresh Whitish Grey Very Strong Rock		90%	90%
30.0									
30.5									
31.0	RUN 18	-	-	-	-	Fresh Whitish Grey Very Strong Rock		94%	94%
31.5									
32.0									
32.5	RUN 19	-	-	-	-	Fresh Whitish Grey Very Strong Rock		98%	98%
33.0									
33.5									
34.0	RUN 20	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
34.5									
35.0									

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 08**
Location:	**Silver Jubilee Park, K R Market, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**19.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**53.00**	Ending date:	**27.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1434564.678
Ground water depth(m) :	**2.00**			Easting	780311.207

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
35.5	RUN 21	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
36.0									
36.5									
37.0	RUN 22	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
37.5									
38.0									
38.5	RUN 23	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
39.0									
39.5									
40.0	RUN 24	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
40.5									
41.0									
41.5	RUN 25	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
42.0									
42.5									
43.0	RUN 26	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
43.5									
44.0									
44.5	RUN 27	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
45.0									
45.5									
46.0	RUN 28	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
46.5									
47.0									
47.5	RUN 29	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 08**
Location:	**Silver Jubilee Park, K R Market, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**19.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**53.00**	Ending date:	**27.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1434564.678
Ground water depth(m) :	**2.00**			Easting	780311.207

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
48.0									
48.5									
49.0	RUN 30	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
49.5									
50.0									
50.5	RUN 31	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
51.0									
51.5									
52.0	RUN 32	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
52.5									
53.0	RUN 33	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 53.0 Meters.		RUN	Rock Coring
DS	Disturbed sample			GWL	Ground water level
SPT	Standard penetration test			Logged by	AA
R	Refusal- N value >50			Checked by	MH

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 09**
Location:	**Lal Bagh, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**01.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**42.00**	Ending date:	**09.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1433278.783
Ground water depth(m) :	**8.00**			Easting	780725.643

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5 1.0 1.5	SPT 1	5	7	10	**17**	Medium Dense Brownish Silty SAND			
2.0 2.5 3.0	SPT 2	12	15	18	**33**	Dense Brownish Silty SAND			
3.5 4.0 4.5	SPT 3	12	17	17	**34**	Dense Brownish Silty SAND			
5.0 5.5 6.0	SPT 4	14	17	19	**36**	Dense Brownish Silty SAND			
6.5 7.0 7.5	SPT 5	16	20	22	**42**	Dense Brownish Silty SAND			
8.0 8.5 9.0	SPT 6	18	20	24	**44**	Dense Whitish Yellow Silty SAND			
9.5 10.0									

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 09**
Location:	**Lal Bagh, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**01.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**42.00**	Ending date:	**09.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1433278.783
Ground water depth(m) :	**8.00**			Easting	780725.643

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5	SPT 7	21	24	26	**50**	Very Dense Whitish Yellow Silty SAND			
11.0									
11.5									
12.0	SPT 8	25	50/ 12cm	R	**R**	Very Dense Whitish Yellow Silty SAND			
12.5									
13.0									
13.5	SPT 9	30	50/ 10cm	R	**R**	Very Dense Whitish Yellow Silty SAND			
14.0									
14.5									
15.0	SPT 10	20	24	30	**54**	Very Dense Whitish Yellow Silty SAND			
15.5									
16.0									
16.5	SPT 11	50/ 8cm	R	R	**R**	Very Dense Whitish Grey Silty SAND			
17.0									
17.5									
18.0	SPT 12	50/ 8cm	R	R	**R**	Very Dense Whitish Grey Silty SAND			
18.5									
19.0									
19.5	SPT 13	50/ 7cm	R	R	**R**	Very Dense Whitish Silty SAND			
20.0									
20.5									
21.0	SPT 14	50/ 5cm	R	R	**R**	Very Dense Whitish Silty SAND			
21.5									
22.0									
22.5	SPT 15	50/ 5cm	R	R	**R**	Very Dense Whitish Silty SAND			
23.0									
23.5									
24.0	SPT 16	50/ 4cm	R	R	**R**	Very Dense Whitish Brown Silty SAND			
24.5									
25.0									
25.5	SPT 17	50/ 4cm	R	R	**R**	Very Dense Whitish Brown Silty SAND			

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 09**
Location:	**Lal Bagh, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**01.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**42.00**	Ending date:	**09.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1433278.783
Ground water depth(m) :	**8.00**			Easting	780725.643

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
26.0 26.5 27.0 27.5 28.0	SPT 18	50/ 4cm	R	R	**R**	Very Dense Whitish Brown Silty SAND			
28.5	SPT 19	50/ 4cm	R	R	**R**	Very Dense Whitish Brown Silty SAND			
29.0 29.5 30.0	RUN 17	-	-	-	-	Highly Weathered Brownish White Weak Rock		28%	Nill
30.5 31.0 31.5	RUN 18	-	-	-	-	Moderately Weathered Brownish White Weak Rock		33%	29%
32.0 32.5 33.0	RUN 19	-	-	-	-	Moderately Weathered Brownish White Weak Rock		32%	11%
33.5 34.0 34.5	RUN 20	-	-	-	-	Slightly Weathered Whitish Medium Strong Rock		89%	78%
35.0 35.5 36.0	RUN 21	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		95%	82%
36.5 37.0 37.5	RUN 22	-	-	-	-	Fresh Whitish Grey Strong Rock		99%	99%
38.0 38.5 39.0	RUN 23	-	-	-	-	Fresh Whitish Grey Strong Rock		97%	97%
39.5 40.0 40.5	RUN 24	-	-	-	-	Fresh Whitish Grey Strong Rock		97%	97%
41.0 41.5 42.0	RUN 25	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 42.0 Meters.		RUN	Rock Coring
DS	Disturbed sample			GWL	Ground water level
SPT	Standard penetration test			Logged by	AA
R	Refusal- N value >50			Checked by	MH

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 11**
Location:	**Pwd Quarters, Siddapura, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**17.01.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**39.00**	Ending date:	**17.01.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1432551.460
Ground water depth(m) :	**6.5**			Easting	780959.135

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5 1.0 1.5 2.0 2.5 3.0 3.5	SPT 1 SPT 2	3 50/ 5cm	3 R	4 R	**7** **R**	Loose Brownish Silty SAND Very Dense Whitish Yellow Silty SAND			
4.0 4.5	SPT 3	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
5.0 5.5 6.0	RUN 1	-	-	-	-	Highly Weathered Yellowish White Weak Rock		21%	9%
6.5 7.0 7.5	RUN 2	-	-	-	-	Highly Weathered Whitish Grey Medium Strong Rock		30%	30%
8.0 8.5 9.0	RUN 3	-	-	-	-	Moderately Weathered Whitish Grey Medium Strong Rock		34%	30%
9.5 10.0 10.5	RUN 4	-	-	-	-	Slightly Weathered Whitish Grey Medium Strong Rock		38%	31%
11.0 11.5 12.0	RUN 5	-	-	-	-	Slightly Weathered Whitish Grey Medium Strong Rock		45%	29%
12.5 13.0 13.5	RUN 6	-	-	-	-	Slightly Weathered Whitish Grey Medium Strong Rock		54%	41%
14.0 14.5 15.0	RUN 7	-	-	-	-	Slightly Weathered Whitish Grey Medium Strong Rock		60%	40%
15.5 16.0 16.5	RUN 8	-	-	-	-	Slightly Weathered Whitish Grey Medium Strong Rock		74%	58%
17.0 17.5 18.0	RUN 9	-	-	-	-	Slightly Weathered Whitish Grey Medium Strong Rock		77%	65%
18.5 19.0 19.5	RUN 10	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		84%	80%
20.0 20.5	RUN 11	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		85%	78%

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APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 11**
Location:	**Pwd Quarters, Siddapura, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**17.01.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**39.00**	Ending date:	**17.01.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1432551.460
Ground water depth(m) :	**6.5**			Easting	780959.135

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
21.0						Rock			
21.5									
22.0	RUN 12	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		86%	65%
22.5									
23.0									
23.5	RUN 13	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		89%	82%
24.0									
24.5									
25.0	RUN 14	-	-	-	-	Fresh Whitish Grey Strong Rock		88%	88%
25.5									
26.0									
26.5	RUN 15	-	-	-	-	Fresh Whitish Grey Strong Rock		94%	94%
27.0									
27.5									
28.0	RUN 16	-	-	-	-	Fresh Whitish Grey Strong Rock		95%	95%
28.5									
29.0									
29.5	RUN 17	-	-	-	-	Fresh Whitish Grey Strong Rock		99%	99%
30.0									
30.5									
31.0	RUN 18	-	-	-	-	Fresh Whitish Grey Strong Rock		99%	99%
31.5									
32.0									
32.5	RUN 19	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
33.0									
33.5									
34.0	RUN 20	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
34.5									
35.0									
35.5	RUN 21	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
36.0									
36.5									
37.0	RUN 22	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
37.5									
38.0									
38.5	RUN 23	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
39.0									

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 39.0 Meters.		RUN	Rock Coring
DS	Disturbed sample			GWL	Ground water level
SPT	Standard penetration test			Logged by	AA
R	Refusal- N value >50			Checked by	MH

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 13**
Location:	**NIMHANS, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**22.01.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**75.00**	Ending date:	**24.01.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431872.322
Ground water depth(m) :	**9.00**			Easting	781490.312

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5 1.0 1.5 2.0	SPT 1	5	6	10	**16**	Medium Dense Brownish Silty SAND			
2.5 3.0 3.5	SPT 2	9	12	17	**29**	Medium Dense Whitish Brown Silty SAND			
4.0 4.5 5.0	SPT 3	12	8	6	**14**	Medium Dense Whitish Brown Silty SAND			
5.5 6.0 6.5	SPT 4	50/ 11cm	R	R	**R**	Very Dense Brownish White Silty SAND			
7.0 7.5 8.0	SPT-5	50/ 4cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
8.5 9.0 9.5 10.0	SPT-6	50/ 3cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			

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APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 13**
Location:	**NIMHANS, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**22.01.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**75.00**	Ending date:	**24.01.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431872.322
Ground water depth(m) :	**9.00**			Easting	781490.312

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5	SPT-7	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
11.0 11.5 12.0	RUN 1	-	-	-	-	Moderately Weathered Brownish White Weak Rock		57%	50%
12.5 13.0 13.5	RUN 2	-	-	-	-	Slightly Weathered Brownish White Medium Strong Rock		81%	75%
14.0 14.5 15.0	RUN 3	-	-	-	-	Slightly Weathered Brownish White Strong Rock		76%	76%
15.5 16.0 16.5	RUN 4	-	-	-	-	Fresh Greyish White Strong Rock		75%	73%
17.0 17.5 18.0	RUN 5	-	-	-	-	Fresh Greyish White Strong Rock		75%	70%
18.5 19.0 19.5	RUN 6	-	-	-	-	Fresh Greyish White Strong Rock		74%	74%
20.0 20.5 21.0	RUN 7	-	-	-	-	Fresh Greyish White Strong Rock		75%	75%
21.5 22.0 22.5	RUN 8	-	-	-	-	Fresh Greyish White Strong Rock		79%	79%
23.0 23.5 24.0	RUN 9	-	-	-	-	Fresh Greyish White Very Strong Rock		83%	83%
24.5 25.0 25.5	RUN 10	-	-	-	-	Fresh Greyish Very Strong Rock		98%	98%
26.0 26.5 27.0	RUN 11	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
27.5 28.0 28.5	RUN 12	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
29.0 29.5 30.0	RUN 13	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
30.5 31.0 31.5	RUN 14	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
32.0									

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 13**
Location:	**NIMHANS, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**22.01.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**75.00**	Ending date:	**24.01.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431872.322
Ground water depth(m) :	**9.00**			Easting	781490.312

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
32.5	RUN 15	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
33.0									
33.5									
34.0	RUN 16	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
34.5									
35.0									
35.5	RUN 17	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
36.0									
36.5									
37.0	RUN 18	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
37.5									
38.0									
38.5	RUN 19	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
39.0									
39.5									
40.0	RUN 20	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
40.5									
41.0									
41.5	RUN 21	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
42.0									
42.5									
43.0	RUN 22	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
43.5									
44.0									
44.5	RUN 23	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
45.0									
45.5									
46.0	RUN 24	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
46.5									
47.0									
47.5	RUN 25	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
48.0									
48.5									
49.0	RUN 26	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
49.5									
50.0									
50.5	RUN 27	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
51.0									
51.5									
52.0	RUN 28	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
52.5									
53.0									
53.5	RUN 29	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
54.0									
54.5									
55.0	RUN 30	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
55.5									

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 13**
Location:	**NIMHANS, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**22.01.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**75.00**	Ending date:	**24.01.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431872.322
Ground water depth(m) :	**9.00**			Easting	781490.312

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
56.0									
56.5	RUN 31	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
57.0									
57.5									
58.0	RUN 32	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
58.5									
59.0									
59.5	RUN 33	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
60.0									
60.5									
61.0	RUN 34	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
61.5									
62.0									
62.5	RUN 35	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
63.0									
63.5									
64.0	RUN 36	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
64.5									
65.0									
65.5	RUN 37	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
66.0									
66.5									
67.0	RUN 38	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
67.5									
68.0									
68.5	RUN 39	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
69.0									
69.5									
70.0	RUN 40	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
70.5									
71.0									
71.5	RUN 41	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
72.0									
72.5									
73.0	RUN 42	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
73.5									
74.0									
74.5	RUN 43	-	-	-	-	Fresh Greyish Very Strong Rock		100%	100%
75.0									

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 75.0 Meters.	RUN / Rock Coring
DS	Disturbed sample		GWL / Ground water level
SPT	Standard penetration test		Logged by: AA
R	Refusal- N value >50		Checked by: MH

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 14**
Location:	**Govt ITI College, Dairy Circle, Hosur Road, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**09.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**70.00**	Ending date:	**13.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431516.247
Ground water depth(m) :	**13.00**			Easting	782127.304

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5									
1.0									
1.5	SPT 1	7	9	12	**21**	Medium Dense Greyish Brown Silty SAND			
2.0									
2.5									
3.0	SPT 2	7	12	16	**28**	Medium Dense Whitish Yellow Silty SAND			
3.5									
4.0									
4.5	SPT 3	8	12	15	**27**	Medium Dense Whitish Yellow Silty SAND			
5.0									
5.5									
6.0	SPT 4	9	15	23	**38**	Dense Whitish Yellow Silty SAND			
6.5									
7.0									
7.5	SPT-5	7	9	11	**20**	Medium Dense Whitish Yellow Silty SAND			
8.0									
8.5									
9.0	SPT-6	9	12	16	**28**	Medium Dense Whitish Yellow Silty SAND			
9.5									
10.0									

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 14**
Location:	**Govt ITI College, Dairy Circle, Hosur Road, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**09.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**70.00**	Ending date:	**13.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431516.247
Ground water depth(m) :	**13.00**			Easting	782127.304

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5	SPT-7	12	13	17	**30**	Dense Yellowish White Silty SAND			
11.0									
11.5									
12.0	SPT-8	11	15	19	**34**	Dense Yellowish White Silty SAND			
12.5									
13.0									
13.5	SPT-9	43	50/ 9cm	R	**R**	Very Dense Yellowish White Silty SAND			
14.0									
14.5									
15.0	SPT-10	50/ 12cm	R	R	**R**	Very Dense Yellowish White Silty SAND			
15.5									
16.0									
16.5	SPT-11	50/ 3cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
17.0									
17.5									
18.0	SPT-12	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
18.5									
19.0	RUN 1	-	-	-	**-**	Moderately Weathered Whitish Grey Medium Strong Rock		17%	Nill
19.5									
20.0									
20.5	RUN 2	-	-	-	**-**	Fresh Brownish White Medium Strong Rock		87%	87%
21.0									
21.5									
22.0	RUN 3	-	-	-	**-**	Fresh Whitish Grey Medium Strong Rock		90%	90%
22.5									
23.0									
23.5	RUN 4	-	-	-	**-**	Fresh Whitish Grey Medium Strong Rock		98%	98%
24.0									

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 14**
Location:	**Govt ITI College, Dairy Circle, Hosur Road, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**09.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**70.00**	Ending date:	**13.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431516.247
Ground water depth(m) :	**13.00**			Easting	782127.304

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
24.5 25.0 25.5	RUN 5	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		93%	93%
26.0 26.5 27.0	RUN 6	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		93%	93%
27.5 28.0 28.5	RUN 7	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		91%	91%
29.0 29.5 30.0	RUN 8	-	-	-	-	Fresh Whitish Grey Strong Rock		94%	94%
30.5 31.0 31.5	RUN 9	-	-	-	-	Fresh Whitish Grey Strong Rock		96%	96%
32.0 32.5 33.0	RUN 10	-	-	-	-	Fresh Whitish Grey Strong Rock		96%	96%
33.5 34.0 34.5	RUN 11	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
35.0 35.5 36.0	RUN 12	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
36.5 37.0 37.5	RUN 13	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
38.0 38.5 39.0	RUN 14	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
39.5 40.0 40.5	RUN 15	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
41.0 41.5 42.0	RUN 16	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
42.5 43.0 43.5	RUN 17	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%

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APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 14**
Location:	**Govt ITI College, Dairy Circle, Hosur Road, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**09.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**70.00**	Ending date:	**13.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431516.247
Ground water depth(m) :	**13.00**			Easting	782127.304

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
44.0									
44.5	RUN 18	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
45.0									
45.5									
46.0	RUN 19	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
46.5									
47.0									
47.5	RUN 20	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
48.0									
48.5									
49.0	RUN 21	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
49.5									
50.0									
50.5	RUN 22	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
51.0									
51.5									
52.0	RUN 23	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
52.5									
53.0									
53.5	RUN 24	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
54.0									
54.5									
55.0	RUN 25	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
55.5									
56.0									
56.5	RUN 26	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
57.0									
57.5									
58.0	RUN 27	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
58.5									
59.0									
59.5	RUN 28	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
60.0									
60.5									
61.0	RUN 29	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
61.5									
62.0									
62.5	RUN 30	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
63.0									

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 14**
Location:	**Govt ITI College, Dairy Circle, Hosur Road, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**09.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**70.00**	Ending date:	**13.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431516.247
Ground water depth(m) :	**13.00**			Easting	782127.304

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
63.5 64.0 64.5	RUN 31	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
65.0 65.5 66.0	RUN 32	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
66.5 67.0 67.5	RUN 33	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
68.0 68.5 69.0	RUN 34	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
69.5 70.0	RUN 35	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 70.0 Meters.		RUN	Rock Coring
DS	Disturbed sample			GWL	Ground water level
SPT	Standard penetration test			Logged by	AA
R	Refusal- N value >50			Checked by	MH

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 15**
Location:	**Christ Univercity, Hosur Road, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**11.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**60.00**	Ending date:	**15.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431335.927
Ground water depth(m) :	**5.00**			Easting	782592.586

Depth (m)	**Sample No.**	**SPT Blows/15cm**			**"N" value**	**Description of Strata**	**Legend**	**Total core recovery**	**Rock Quality Designation**
0.0		**15**	**30**	**45**				**TCR (%)**	**RQD (%)**
0.5									
1.0									
1.5	SPT 1	3	5	5	**10**	Medium Dense Brownish Silty SAND			
2.0									
2.5									
3.0	SPT 2	7	9	11	**20**	Medium Dense Greyish Yellow Silty SAND			
3.5									
4.0									
4.5	SPT 3	10	13	50/ 10cm	**R**	Very Dense Greyish Silty SAND with Mica			
5.0									
5.5									
6.0	SPT 4	50/ 5Cm	R	R	**R**	Very Dense Greyish Silty SAND with Mica			
6.5									
7.0	RUN 1	-	-	-	**-**	Moderately Weathered Whitish Brown Weak Rock		37%	17%
7.5									
8.0									
8.5	RUN 2	-	-	-	**-**	Moderately Weathered Whitish Weak Rock		44%	15%
9.0									
9.5									
10.0	RUN 3	-	-	-	**-**	Completely Weathered Greyish Weak Rock		4%	Nill

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 15**
Location:	**Christ Univercity, Hosur Road, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**11.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**60.00**	Ending date:	**15.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431335.927
Ground water depth(m) :	**5.00**			Easting	782592.586

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5						Weak Rock			
11.0									
11.5	RUN 4	-	-	-	-	Completely Weathered Greyish Medium Strong Rock		5%	Nill
12.0									
12.5									
13.0	RUN 5	-	-	-	-	Highly Weathered Whitish Grey Medium Strong Rock		30%	19%
13.5									
14.0									
14.5	RUN 6	-	-	-	-	Slightly Weathered Whitish Grey Medium Strong Rock		65%	65%
15.0									
15.5									
16.0	RUN 7	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		84%	84%
16.5									
17.0									
17.5	RUN 8	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		73%	58%
18.0									
18.5									
19.0	RUN 9	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		80%	80%
19.5									
20.0									
20.5	RUN 10	-	-	-	-	Fresh Whitish Grey Strong Rock		80%	80%
21.0									
21.5									
22.0	RUN 11	-	-	-	-	Fresh Whitish Grey Strong Rock		79%	79%
22.5									
23.0									
23.5	RUN 12	-	-	-	-	Fresh Whitish Grey Strong Rock		75%	75%
24.0									
24.5									
25.0	RUN 13	-	-	-	-	Fresh Whitish Grey Strong Rock		82%	82%
25.5									
26.0									
26.5	RUN 14	-	-	-	-	Fresh Whitish Grey Strong Rock		81%	81%
27.0									
27.5									
28.0	RUN 15	-	-	-	-	Fresh Whitish Grey Very Strong Rock		83%	83%
28.5									

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 15**
Location:	**Christ Univercity, Hosur Road, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**11.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**60.00**	Ending date:	**15.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431335.927
Ground water depth(m) :	**5.00**			Easting	782592.586

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
29.0 29.5 30.0	RUN 16	-	-	-	-	Fresh Whitish Grey Very Strong Rock		93%	93%
30.5 31.0 31.5	RUN 17	-	-	-	-	Fresh Whitish Grey Very Strong Rock		98%	98%
32.0 32.5 33.0	RUN 18	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
33.5 34.0 34.5	RUN 19	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
35.0 35.5 36.0	RUN 20	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
36.5 37.0 37.5	RUN 21	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
38.0 38.5 39.0	RUN 22	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
39.5 40.0 40.5	RUN 23	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
41.0 41.5 42.0	RUN 24	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
42.5 43.0 43.5	RUN 25	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
44.0 44.5 45.0	RUN 26	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
45.5 46.0 46.5	RUN 27	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
47.0						Fresh Whitish Grey Very Strong			

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 15**
Location:	**Christ Univercity, Hosur Road, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**11.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**60.00**	Ending date:	**15.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1431335.927
Ground water depth(m) :	**5.00**			Easting	782592.586

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
47.5 48.0	RUN 28	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
48.5 49.0 49.5	RUN 29	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
50.0 50.5 51.0	RUN 30	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
51.5 52.0 52.5	RUN 31	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
53.0 53.5 54.0	RUN 32	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
54.5 55.0 55.5	RUN 33	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
56.0 56.5 57.0	RUN 34	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
57.5 58.0 58.5	RUN 35	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%
59.0 59.5 60.0	RUN 36	-	-	-	-	Fresh Whitish Grey Very Strong Rock		100%	100%

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 60.0 Meters.		RUN	Rock Coring
DS	Disturbed sample			GWL	Ground water level
SPT	Standard penetration test			Logged by	AA
R	Refusal- N value >50			Checked by	MH

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 16**
Location:	**St Johns Staff Quarters, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**01.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**36.00**	Ending date:	**04.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1430910.445
Ground water depth(m) :	**12.00**			Easting	783433.917

Depth (m)	**Sample No.**	**SPT Blows/15cm**			**"N" value**	**Description of Strata**	**Legend**	**Total core recovery**	**Rock Quality Designation**
0.0		**15**	**30**	**45**				**TCR (%)**	**RQD (%)**
0.5									
1.0									
1.5	SPT 1	10	12	16	**28**	Medium Dense Reddish Brown Silty SAND			
2.0									
2.5									
3.0	SPT 2	9	16	24	**40**	Dense Reddish Brown Silty SAND			
3.5									
4.0									
4.5	SPT 3	50/ 13cm	R	R	**R**	Very Dense Reddish Brown Silty SAND			
5.0									
5.5									
6.0	SPT 4	7	14	21	**35**	Dense Pinkish White Sandy SILT			
6.5									
7.0									
7.5	SPT-5	10	16	26	**42**	Dense Pinkish White Sandy SILT			
8.0									
8.5									
9.0	SPT-6	11	20	42	**62**	Very Dense Whitish Yellow Sandy SILT			
9.5									
10.0									

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 16**
Location:	**St Johns Staff Quarters, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**01.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**36.00**	Ending date:	**04.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1430910.445
Ground water depth(m) :	**12.00**			Easting	783433.917

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5	SPT-7	32	50/ 11cm	R	**R**	Very Dense Yellowish White Sandy SILT			
11.0									
11.5									
12.0	SPT-8	13	21	31	**52**	Very Dense Yellowish White Silty SAND			
12.5									
13.0									
13.5	SPT-9	28	50/ 10cm	R	**R**	Very Dense Yellowish White Silty SAND			
14.0									
14.5									
15.0	SPT-10	10	15	26	**41**	Very Dense Yellowish White Silty SAND			
15.5									
16.0									
16.5	SPT-11	12	18	32	**50**	Very Dense Yellowish White Silty SAND			
17.0									
17.5									
18.0	SPT-12	50/ 5cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
18.5									
19.0									
19.5	SPT-13	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
20.0									
20.5	RUN 1	-	-	-	**-**	Highly Weathered Whitish Brown Weak Rock		21%	Nill
21.0									
21.5									
22.0	RUN 2	-	-	-	**-**	Moderately Weathered Whitish Brown Weak Rock		34%	28%
22.5									
23.0									
23.5	RUN 3	-	-	-	**-**	Moderately Weathered Whitish Brown Weak Rock		35%	30%

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 16**
Location:	**St Johns Staff Quarters, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**01.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**36.00**	Ending date:	**04.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1430910.445
Ground water depth(m) :	**12.00**			Easting	783433.917

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
24.0						Brown Weak Rock			
24.5									
25.0	RUN 4	-	-	-	-	Moderately Weathered Whitish Brown Weak Rock		21%	Nill
25.5									
26.0									
26.5	RUN 5	-	-	-	-	Slightly Weathered Whitish Brown Medium Strong Rock		22%	12%
27.0									
27.5									
28.0	RUN 6	-	-	-	-	Slightly Weathered Whitish Brown Medium Strong Rock		27%	27%
28.5									
29.0									
29.5	RUN 7	-	-	-	-	Slightly Weathered Whitish Brown Medium Strong Rock		41%	41%
30.0									
30.5									
31.0	RUN 8	-	-	-	-	Slightly Weathered Whitish Brown Medium Strong Rock		52%	52%
31.5									
32.0									
32.5	RUN 9	-	-	-	-	Slightly Weathered Whitish Brown Medium Strong Rock		62%	62%
33.0									
33.5									
34.0	RUN 10	-	-	-	-	Fresh Whitish Brown Strong Rock		64%	64%
34.5									
35.0									
35.5	RUN 11	-	-	-	-	Fresh Whitish Brown Strong Rock		78%	78%
36.0									

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 36.0 Meters.	RUN / Rock Coring
DS	Disturbed sample		GWL / Ground water level
SPT	Standard penetration test		Logged by / AA
R	Refusal- N value >50		Checked by / MH

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 17**
Location:	**St Johns Staff Quarters, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**01.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**30.00**	Ending date:	**04.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1430692.502
Ground water depth(m) :	**Nill**			Easting	783651.014

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5									
1.0									
1.5	SPT 1	7	9	11	**20**	Medium Dense Reddish Brown Silty SAND			
2.0									
2.5									
3.0	SPT 2	10	15	19	**34**	Dense Reddish Brown Silty SAND			
3.5									
4.0									
4.5	SPT 3	12	17	22	**39**	Dense Reddish Brown Silty SAND			
5.0									
5.5									
6.0	SPT 4	10	16	18	**34**	Dense Brownish Yellow Silty SAND			
6.5									
7.0									
7.5	SPT-5	12	20	22	**42**	Dense Brownish Yellow Silty SAND			
8.0									
8.5									
9.0	SPT-6	9	17	22	**39**	Dense Brownish Yellow Silty SAND			
9.5									
10.0									

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 17**
Location:	**St Johns Staff Quarters, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**01.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**30.00**	Ending date:	**04.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1430692.502
Ground water depth(m) :	**Nill**			Easting	783651.014

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5	SPT-7	10	18	25	**43**	Dense Brownish Yellow Silty SAND			
11.0									
11.5									
12.0	SPT-8	8	12	15	**27**	Medium Dense Pinkish Silty SAND			
12.5									
13.0									
13.5	SPT-9	9	14	19	**33**	Dense Pinkish Silty SAND			
14.0									
14.5									
15.0	SPT-10	41	50/ 10cm	R	**R**	Very Dense Whitish Yellow Silty SAND			
15.5									
16.0									
16.5	SPT-11	12	18	32	**50**	Very Dense Whitish Yellow Silty SAND			
17.0									
17.5									
18.0	SPT-12	50/ 5cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
18.5									
19.0									
19.5	SPT-13	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
20.0									
20.5									
21.0	SPT-14	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
21.5									
22.0									

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APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 17**
Location:	**St Johns Staff Quarters, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**01.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**30.00**	Ending date:	**04.02.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1430692.502
Ground water depth(m) :	**Nill**			Easting	783651.014

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
22.5	SPT-15	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
23.0									
23.5									
24.0	SPT-16	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
24.5									
25.0									
25.5	SPT-17	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
26.0									
26.5									
27.0	SPT-18	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
27.5									
28.0									
28.5	SPT-19	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			
29.0									
29.5									
30.0	SPT-20	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Soft Rock (Washed Sample)			

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 30.0 Meters.		RUN	Rock Coring
DS	Disturbed sample			GWL	Ground water level
SPT	Standard penetration test			Logged by	AA
R	Refusal- N value >50			Checked by	MH

APPENDIX-A-1

GEOLOGICAL BORELOG DETAILS

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GEOLOGICAL LOG OF BOREHOLE: BH - 03

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Golf Course, Bengaluru.	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	15.02.2025	COLLAR ELEVATION:		100.12	
COMPLETED	26.02.2025	Co-Ordinates:	Easting	780122.621	
TOTAL DEPTH	57m		Northing	1437522.04	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	4	7	9	16	166.7	
1.50	3.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	5	8	12	20	104.2	
3.00	4.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	50/ 13cm	R	R	R	55.6	
4.50	6.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX	-	Grey		-	-	50/ 2cm	R	R	R	41.7	
6.00	7.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX	-	Grey		-	-	50/ 2cm	R	R	R	38.5	
7.50	9.00	Highly Weathered, Granitic Gneiss		IV	Weak Rock	29°	0.42						28	0.00	0		NX	-	Grey	-		-	-	-	-	-	20.8	
9.00	10.50	Highly Weathered, Granitic Gneiss		IV	Weak Rock	31°	0.44				-	-	29	0.33	22		NX	-	Grey	-		-	-	-	-	-	20.0	
10.50	12.00	Highly Weathered, Granitic Gneiss		IV	Weak Rock	47°	0.47						31	0.33	22		NX	-	Grey	-	-		-	-	-	-	19.2	
12.00	13.50	Highly Weathered, Granitic Gneiss		IV	Medium Strong Rock	41°	0.32					-	21	0.32	21		NX	-	Grey	-	-		-	-	-	-	18.5	
13.50	15.00	Highly Weathered, Granitic Gneiss		IV	Medium Strong Rock	35°	0.53					-	35	0.45	30		NX	Δ GWL-15m	Grey	-	-		-	-	-	-	20.2	
15.00	16.50	Highly Weathered, Granitic Gneiss		IV	Medium Strong Rock	52°	0.29						19	0.18	12		NX		Grey	-	-		-	-	-	-	21.9	
16.50	18.00	Highly Weathered, Granitic Gneiss		IV	Medium Strong Rock	24°	0.44						29	0.18	12		NX		Grey	-	-		-	-	-	-	20.8	
18.00	19.50	Fresh, Granitic Gneiss		I	Strong Rock	8°	0.89						59	0.89	59		NX		Grey	-		-	-	-	-	-	17.9	
19.50	21.00	Fresh, Granitic Gneiss		I	Strong Rock	13°	0.48						32	0.48	32		NX		Grey	-		-	-	-	-	-	19.2	

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GEOLOGICAL LOG OF BOREHOLE: BH - 03

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Golf Course, Bengaluru.	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	15.02.2025	COLLAR ELEVATION:	100.12		
COMPLETED	26.02.2025	Co-Ordinates: Easting	780122.621		
TOTAL DEPTH	57m	Co-Ordinates: Northing	1437522.04		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
21.00	22.50	Fresh, Granitic Gneiss		I	Strong Rock	24°	0.74						49	0.74	49		NX		Grey	-		-	-	-	-	-	17.9	
22.50	24.00	Highly Weathered, Granitic Gneiss		IV	Strong Rock	28°	0.57						38	0.47	31		NX		Grey	-		-	-	-	-	-	18.8	
24.00	25.50	Fresh, Granitic Gneiss		I	Strong Rock	29°	0.74						49	0.74	49		NX		Grey	-		-	-	-	-	-	17.9	
25.50	27.00	Fresh, Granitic Gneiss		I	Strong Rock	37°	1.16						77	0.90	60		NX		Grey	-		-	-	-	-	-	16.7	
27.00	28.50	Fresh, Granitic Gneiss		I	Strong Rock	21°	0.60						40	0.38	25		NX		Grey	-		-	-	-	-	-	17.9	
28.50	30.00	Fresh, Granitic Gneiss		I	Strong Rock	17°	1.19						79	1.10	73		NX		Grey	-		-	-	-	-	-	13.9	
30.00	31.50	Fresh, Granitic Gneiss		I	Strong Rock	24°	1.11						74	1.11	74		NX		Grey	-		-	-	-	-	-	13.2	
31.50	33.00	Fresh, Granitic Gneiss		I	Strong Rock	31°	1.35						90	1.35	90		NX		Grey	-		-	-	-	-	-	13.5	
33.00	34.50	Fresh, Granitic Gneiss		I	Very Strong Rock	28°	1.40						93	1.40	93		NX		Grey	-		-	-	-	-	-	12.5	
34.50	36.00	Fresh, Granitic Gneiss		I	Very Strong Rock	20°	1.38						92	1.35	90		NX		Grey	-		-	-	-	-	-	12.2	
36.00	37.50	Fresh, Granitic Gneiss		I	Very Strong Rock	15°	1.46						97	1.46	97		NX		Grey		-	-	-	-	-	-	12.5	
37.50	39.00	Fresh, Granitic Gneiss		I	Very Strong Rock	9°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	11.7	
39.00	40.50	Fresh, Granitic Gneiss		I	Very Strong Rock	12°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	11.4	
40.50	42.00	Fresh, Granitic Gneiss		I	Very Strong Rock	14°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	11.3	

The Soft Rock encountered after 3.5m depth.
The Rockmass encountered is Hard Granitic Gneiss from 7.5m depth.
Ground Water Level Encountered at 15.0m depth.

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GEOLOGICAL LOG OF BOREHOLE: BH - 03

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Golf Course, Bengaluru.	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	15.02.2025	COLLAR ELEVATION:	100.12		
COMPLETED	26.02.2025	Co-Ordinates: Easting	780122.621		
TOTAL DEPTH	57m	Co-Ordinates: Northing	1437522.04		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
42.00	43.50	Fresh, Granitic Gneiss		I	Very Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	11.2	
43.50	45.00	Fresh, Granitic Gneiss		I	Very Strong Rock	11°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	10.4	
45.00	46.50	Fresh, Granitic Gneiss		I	Very Strong Rock	10°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	10.0	
46.50	48.00	Fresh, Granitic Gneiss		I	Very Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	10.0	
48.00	49.50	Fresh, Granitic Gneiss		I	Very Strong Rock	10°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	10.2	
49.50	51.00	Fresh, Granitic Gneiss		I	Very Strong Rock	17°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	10.0	
51.00	52.50	Fresh, Granitic Gneiss		I	Very Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	9.6	
52.50	54.00	Fresh, Granitic Gneiss		I	Very Strong Rock	12°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.9	
54.00	55.50	Fresh, Granitic Gneiss		I	Very Strong Rock	9°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.8	
55.50	57.00	Fresh, Granitic Gneiss		I	Very Strong Rock	9°	0.50						100	0.50	100		NX		Grey		-	-	-	-	-	-	8.5	

SOIL		Disintegrated Rock		Granitic Gneseiss	

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GEOLOGICAL LOG OF BOREHOLE: BH - 05

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Freedom Park, Bengaluru.	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	27.02.2025	COLLAR ELEVATION:		100.15	
COMPLETED	07.03.2025	Co-Ordinates:	Easting	780240.929	
TOTAL DEPTH	32.00		Northing	1436187.314	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	**15cm**	**30cm**	**45cm**	**"N"**		
0.00	1.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	5	3	8	**11**	125.0	
1.50	3.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	15	17	22	**39**	119.0	
3.00	4.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	50/ 10cm	R	R	**R**	108.7	
4.50	6.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	50/ 8cm	R	R	**R**	100.0	
6.00	7.50	Moderately Weathered, Granitic Gneiss		III	Strong Rock	24˚	0.71				-	-	47	0.71	47		NX	-	Grey		-	-	-	-	-	-	31.3	
7.50	9.00	Moderately Weathered, Granitic Gneiss		III	Strong Rock	19˚	0.68				-	-	45	0.68	45		NX	-	Grey	-		-	-	-	-	-	20.8	
9.00	10.50	Highly Weathered, Granitic Gneiss		IV	Strong Rock	21˚	0.38			-	-	-	25	0.00	0		NX	Δ GWL-10.0m	Grey	-	-		-	-	-	-	19.2	
10.50	12.00	Moderately Weathered, Granitic Gneiss		III	Strong Rock	16˚	0.50			-	-	-	33	0.12	8		NX		Grey	-	-		-	-	-	-	15.6	
12.00	13.50	Moderately Weathered, Granitic Gneiss		III	Strong Rock	25˚	0.68				-	-	45	0.68	45		NX		Grey	-	-		-	-	-	-	13.2	

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GEOLOGICAL LOG OF BOREHOLE: BH - 05

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Freedom Park, Bengaluru.	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	27.02.2025	COLLAR ELEVATION:	100.15		
COMPLETED	07.03.2025	Co-Ordinates: Easting	780240.929		
TOTAL DEPTH	32.00	Northing	1436187.314		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
13.50	15.00	Moderately Weathered, Granitic Gneiss		III	Strong Rock	19˚	0.74				-	-	49	0.74	49	NX	NX		Grey	-	-		-	-	-	-	12.5	The Rockmass encountered is Hard Granitic Gneiss from 6.0m depth. Ground Water Level Encountered at 10.0m depth.
15.00	16.50	Moderately Weathered, Granitic Gneiss		III	Strong Rock	37˚	0.48			-	-	-	32	0.47	31		NX		Grey	-	-		-	-	-	-	12.5	
16.50	18.00	Moderately Weathered, Granitic Gneiss		III	Strong Rock	46˚	0.72				-	-	48	0.72	48		NX		Grey	-		-	-	-	-	-	11.9	
18.00	19.50	Slightly Weathered, Granitic Gneiss		II	Strong Rock	31˚	0.69				-	-	46	0.69	46		NX		Grey	-		-	-	-	-	-	10.9	
19.50	21.00	Slightly Weathered, Granitic Gneiss		II	Strong Rock	25˚	0.83				-	-	55	0.65	43		NX		Grey	-		-	-	-	-	-	10.4	
21.00	22.50	Slightly Weathered, Granitic Gneiss		II	Strong Rock	17˚	0.98					-	65	0.89	59		NX		Grey		-	-	-	-	-	-	10.0	

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GEOLOGICAL LOG OF BOREHOLE: BH - 05

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Freedom Park, Bengaluru.	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	27.02.2025	COLLAR ELEVATION:	100.15		
COMPLETED	07.03.2025	Co-Ordinates: Easting	780240.929		
TOTAL DEPTH	32.00	Northing	1436187.314		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery: TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD: RQD (Length in m of core pieces>=10cm)	RQD %	Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss: Nill	Partial	Full	SPT: BLOWS/15CM)			SPT N Value (Blows/cm)	Penetration Rate (mm/min)	Special observations and interpretations
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
22.50	24.00	Slightly Weathered, Granitic Gneiss		II	Strong Rock	15˚	1.28						85	1.17	78		NX		Grey		-	-	-	-	-	-	9.6	
24.00	25.50	Slightly Weathered, Granitic Gneiss		II	Strong Rock	16˚	1.34						89	1.32	88		NX		Grey		-	-	-	-	-	-	9.3	
25.50	27.00	Slightly Weathered, Granitic Gneiss		II	Strong Rock	21˚	1.31						87	1.31	87		NX		Grey		-	-	-	-	-	-	8.9	
27.00	28.50	Slightly Weathered, Granitic Gneiss		II	Very Strong Rock	24˚	1.32						88	1.32	88		NX		Grey		-	-	-	-	-	-	8.6	
28.50	30.00	Fresh, Granitic Gneiss		I	Very Strong Rock	15˚	1.37						91	1.31	87		NX		Grey		-	-	-	-	-	-	8.3	
30.00	31.50	Fresh, Granitic Gneiss		I	Very Strong Rock	12˚	1.35						90	1.35	90		NX		Grey		-	-	-	-	-	-	8.1	
31.50	32.00	Fresh, Granitic Gneiss		I	Very Strong Rock	10˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.6	

SOIL		Disintegrated Rock		Granitic Gneseiss	

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

GEOLOGICAL LOG OF BOREHOLE: BH - 08

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Silver Jublee Park, K R Market, Bengaluru.	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	19.02.2025	COLLAR ELEVATION:		100.12	
COMPLETED	02.03.2025	Co-Ordinates:	Easting	780311.207	
TOTAL DEPTH	53m		Northing	1434564.678	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	**15cm**	**30cm**	**45cm**	**"N"**		
0.00	1.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	8	10	13	**23**	125.0	
1.50	3.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	Δ GWL-2m	Grey		-	-	11	15	17	**32**	83.3	
3.00	4.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 3cm	R	R	**R**	33.8	
4.50	6.00	Moderately Weathered, Granitic Gneiss		III	Weak Rock	27°	0.44			-	-	-	29	0.14	9		NX		Grey	-		-	-	-	-	-	14.7	
6.00	7.50	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	24°	1.07					-	71	0.69	46		NX		Grey	-		-	-	-	-	-	13.5	
7.50	9.00	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	15°	1.35						90	1.35	90		NX		Grey	-		-	-	-	-	-	12.8	
9.00	10.50	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	19°	0.87				-	-	58	0.87	58		NX		Grey	-	-		-	-	-	-	12.6	
10.50	12.00	Slightly Weathered, Granitic Gneiss		II	Strong Rock	11°	1.25						83	1.25	83		NX		Grey	-	-		-	-	-	-	12.0	
12.00	13.50	Slightly Weathered, Granitic Gneiss		II	Strong Rock	27°	1.13					-	75	1.13	75		NX		Grey	-	-		-	-	-	-	11.6	
13.50	15.00	Slightly Weathered, Granitic Gneiss		II	Strong Rock	21°	1.10					-	73	1.10	73		NX		Grey	-			-	-	-	-	10.4	
15.00	16.50	Fresh, Granitic Gneiss		I	Strong Rock	17°	1.22						81	1.22	81		NX		Grey	-		-	-	-	-	-	10.0	
16.50	18.00	Fresh, Granitic Gneiss		I	Strong Rock	10°	1.34						89	1.34	89		NX		Grey		-	-	-	-	-	-	9.6	
18.00	19.50	Fresh, Granitic Gneiss		I	Very Strong Rock	9°	1.47						98	1.47	98		NX		Grey		-	-	-	-	-	-	9.6	
19.50	21.00	Fresh, Granitic Gneiss		I	Very Strong Rock	10°	1.40						93	1.32	88		NX		Grey		-	-	-	-	-	-	9.3	
21.00	22.50	Fresh, Granitic Gneiss		I	Very Strong Rock	24°	1.37						91	1.37	91		NX		Grey		-	-	-	-	-	-	9.3	

CIVIL LAB AND GEOTECH CONSULTANTS

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GEOLOGICAL LOG OF BOREHOLE: BH - 08

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Silver Jublee Park, K R Market, Bengaluru.	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	19.02.2025	COLLAR ELEVATION:		100.12	
COMPLETED	02.03.2025	Co-Ordinates:	Easting	780311.207	
TOTAL DEPTH	53m		Northing	1434564.678	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
22.50	24.00	Fresh, Granitic Gneiss		I	Very Strong Rock	24°	1.49						99	1.49	99	NX	NX		Grey		-	-	-	-	-	-	9.3	
24.00	25.50	Fresh, Granitic Gneiss		I	Very Strong Rock	-	1.46						97	1.46	97		NX		Grey		-	-	-	-	-	-	8.9	
25.50	27.00	Fresh, Granitic Gneiss		I	Very Strong Rock	-	1.49						99	1.49	99		NX		Grey		-	-	-	-	-	-	8.9	
27.00	28.50	Fresh, Granitic Gneiss		I	Very Strong Rock	-	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.6	The Soft Rock encountered after 3.5m depth. The Rockmass encountered is Hard Granitic Gneiss from 4.5m depth. Ground Water Level Encountered at 2.0m depth.
28.50	30.00	Fresh, Granitic Gneiss		I	Very Strong Rock	12°	1.50						100	1.35	90		NX		Grey		-	-	-	-	-	-	8.3	
30.00	31.50	Fresh, Granitic Gneiss		I	Very Strong Rock	8°	1.50						100	1.41	94		NX		Grey		-	-	-	-	-	-	8.4	
31.50	33.00	Fresh, Granitic Gneiss		I	Very Strong Rock	14°	1.50						100	1.47	98		NX		Grey		-	-	-	-	-	-	8.3	
33.00	34.50	Fresh, Granitic Gneiss		I	Very Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.1	
34.50	36.00	Fresh, Granitic Gneiss		I	Very Strong Rock	8°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8	
36.00	37.50	Fresh, Granitic Gneiss		I	Very Strong Rock	24°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.4	
37.50	39.00	Fresh, Granitic Gneiss		I	Very Strong Rock	24°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
39.00	40.50	Fresh, Granitic Gneiss		I	Very Strong Rock	-	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
40.50	42.00	Fresh, Granitic Gneiss		I	Very Strong Rock	-	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
42.00	43.50	Fresh, Granitic Gneiss		I	Very Strong Rock	-	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.8	

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GEOLOGICAL LOG OF BOREHOLE: BH - 08

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Silver Jublee Park, K R Market, Bengaluru.	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	19.02.2025	COLLAR ELEVATION:		100.12	
COMPLETED	02.03.2025	Co-Ordinates:	Easting	780311.207	
TOTAL DEPTH	53m		Northing	1434564.678	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
43.50	45.00	Fresh, Granitic Gneiss		I	Very Strong Rock	-	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.6	
45.00	46.50	Fresh, Granitic Gneiss		I	Very Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.6	
46.50	48.00	Fresh, Granitic Gneiss		I	Very Strong Rock	21°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.4	
48.00	49.50	Fresh, Granitic Gneiss		I	Very Strong Rock	8°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.6	
49.50	51.00	Fresh, Granitic Gneiss		I	Very Strong Rock	12°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.4	
51.00	52.50	Fresh, Granitic Gneiss		I	Very Strong Rock	9°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.5	
52.50	53.00	Fresh, Granitic Gneiss		I	Very Strong Rock	10°	0.50						100	0.50	100		NX		Grey		-	-	-	-	-	-	2.1	

SOIL		Disintegrated Rock	Granitic Gneseiss

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

GEOLOGICAL LOG OF BOREHOLE: BH - 09

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Lal Bagh, Bengaluru	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90^{o}	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	01.03.2025	COLLAR ELEVATION:	100.12		
COMPLETED	09.03.2025	Co-Ordinates: Easting	780725.643		
TOTAL DEPTH	42.00	Co-Ordinates: Northing	1433278.783		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	**15cm**	**30cm**	**45cm**	**"N"**		
0.00	1.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	5	7	10	**17**	166.7	
1.50	3.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	12	15	18	**33**	119.0	
3.00	4.50	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	12	17	17	**34**	96.2	
4.50	6.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	-		NX	-	Grey		-	-	14	17	19	**36**	71.4	
6.00	7.50	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	-		NX	-	Grey		-	-	16	20	22	**42**	73.5	
7.50	9.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	-		NX	Δ GWL-8.0m	Grey		-	-	18	20	24	**44**	64.1	
9.00	10.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	21	24	26	**50**	55.6	
10.50	12.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	25	50/ 12cm	R	**R**	40.3	

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GEOLOGICAL LOG OF BOREHOLE: BH - 09

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Lal Bagh, Bengaluru	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90^{o}	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	01.03.2025	COLLAR ELEVATION:	100.12		
COMPLETED	09.03.2025	Co-Ordinates: Easting	780725.643		
TOTAL DEPTH	42.00	Co-Ordinates: Northing	1433278.783		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	**15cm**	**30cm**	**45cm**	**"N"**		
12.00	13.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-	NX		Grey		-	-	25	50/ 10cm	R	**R**	35.7	
13.50	15.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-	NX		Grey		-	-	20	24	30	**54**	33.3	
15.00	16.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-	NX		Grey		-	-	50/ 8cm	R	R	**R**	31.3	
16.50	18.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-	NX		Grey		-	-	50/ 8cm	R	R	**R**	31.3	
18.00	19.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-	NX		Grey		-	-	50/ 7cm	R	R	**R**	32.1	
19.50	21.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-	NX		Grey		-	-	50/ 5cm	R	R	**R**	31.3	
21.00	22.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-	NX		Grey		-	-	50/ 5cm	R	R	**R**	30.9	The Rockmass encountered is Hard Granitic Gneiss from 28.5m depth. Ground Water Level Encountered at 8.0m depth.
22.50	24.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-	NX		Grey		-	-	50/ 4cm	R	R	**R**	27.8	

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GEOLOGICAL LOG OF BOREHOLE: BH - 09

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Lal Bagh, Bengaluru	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90^{o}	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	01.03.2025	COLLAR ELEVATION:	100.12		
COMPLETED	09.03.2025	Co-Ordinates: Easting	780725.643		
TOTAL DEPTH	42.00	Northing	1433278.783		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	**15cm**	**30cm**	**45cm**	**"N"**		
24.00	25.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 4cm	R	R	**R**	27.8	
25.50	27.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 4cm	R	R	**R**	27.5	
27.00	28.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey	-		-	50/ 4cm	R	R	**R**	27.2	
28.50	30.00	Highly Weathered, Granitic Gneiss		IV	Weak Rock	23˚	0.44			-	-	-	29	0.00	0		NX		Grey	-	-		-	-	-	-	13.2	
30.00	31.50	Modearately Weathered, Granitic Gneiss		III	Weak Rock	17˚	0.50			-	-	-	33	0.44	29		NX		Grey	-	-		-	-	-	-	12.8	
31.50	33.00	Modearately Weathered, Granitic Gneiss		III	Weak Rock	24˚	0.48			-	-	-	32	0.17	11		NX		Grey	-	-		-	-	-	-	12.4	
33.00	34.50	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	34˚	1.34						89	1.17	78		NX		Grey	-		-	-	-	-	-	12.1	
34.50	36.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	15˚	1.43						95	1.23	82		NX		Grey		-	-	-	-	-	-	12.0	

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GEOLOGICAL LOG OF BOREHOLE: BH - 09

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Lal Bagh, Bengaluru	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	01.03.2025	COLLAR ELEVATION:	100.12		
COMPLETED	09.03.2025	Co-Ordinates: Easting	780725.643		
TOTAL DEPTH	42.00	Northing	1433278.783		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
36.00	37.50	Fresh, Granitic Gneiss		I	Strong Rock	13˚	1.49						99	1.49	99		NX		Grey		-	-	-	-	-	-	11.7	
37.50	39.00	Fresh, Granitic Gneiss		I	Strong Rock	16˚	1.46						97	1.46	97		NX		Grey		-	-	-	-	-	-	11.4	
39.00	40.50	Fresh, Granitic Gneiss		I	Strong Rock	20˚	1.46						97	1.46	97		NX		Grey		-	-	-	-	-	-	11.9	
40.50	42.00	Fresh, Granitic Gneiss		I	Strong Rock	12˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	11.8	

SOIL		Disintegrated Rock		Granitic Gneseiss

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

GEOLOGICAL LOG OF BOREHOLE: BH - 11

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Pwd Quarters, Siddapura, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	17.01.2025	COLLAR ELEVATION:		100.120	
COMPLETED	28.01.2025	Co-Ordinates:	Easting	780959.135	
TOTAL DEPTH	39m		Northing	1432551.46	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery: TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD: RQD (Length in m of core pieces>=10cm)	RQD %	Type of Bit	'Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss: Nill	Partial	Full	SPT: BLOWS/15CM)			SPT N Value (Blows/cm)	Penetration Rate (mm/min)	Special observations and interpretations
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Soil		VI	Loose	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	3	3	4	**7**	62.5	
1.50	3.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	50/ 5cm	R	R	**R**	47.6	
3.50	4.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	0.00	-	-	-	-	-	0	0.00	0		NX	-	Grey		-	-	50/ 2cm	R	R	**R**	16.7	
4.50	6.00	Highly Weathered, Granitic Gneiss		IV	Weak Rock	10˚	0.32			-	-	-	21	0.14	9		NX	-	Grey		-	-	-	-	-	-	10.9	
6.00	7.50	Highly Weathered, Granitic Gneiss		IV	Medium Strong Rock	13˚	0.45			-	-	-	30	0.45	30		NX	Δ GWL-6.5m	Grey		-	-	-	-	-	-	10.0	
7.50	9.00	Moderately Weathered, Granitic Gneiss		III	Medium Strong Rock	16˚	0.51			-	-	-	34	0.45	30		NX		Grey		-	-	-	-	-	-	9.6	
9.00	10.50	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	10˚	0.57			-	-	-	38	0.47	31		NX		Grey		-	-	-	-	-	-	10.0	
10.50	12.00	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	12˚	0.68				-	-	45	0.44	29		NX		Grey		-	-	-	-	-	-	9.3	

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GEOLOGICAL LOG OF BOREHOLE: BH - 11

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Pwd Quarters, Siddapura, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	17.01.2025	COLLAR ELEVATION:		100.120	
COMPLETED	28.01.2025	Co-Ordinates:	Easting	780959.135	
TOTAL DEPTH	39m		Northing	1432551.46	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery: TCR Length (m)	Core Recovery: 0-20	Core Recovery: 20-40	Core Recovery: 40-60	Core Recovery: 60-80	Core Recovery: 80-100	Core Recovery: TCR (%)	RQD: RQD (Length in m of core pieces>=10cm)	RQD: RQD %	Type of Bit	'Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss: Nill	Drill Water Loss: Partial	Drill Water Loss: Full	SPT: BLOWS/15CM) 15cm	SPT: BLOWS/15CM) 30cm	SPT: BLOWS/15CM) 45cm	SPT N Value (Blows/cm)	Penetration Rate (mm/min)	Special observations and interpretations
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
12.00	13.50	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	15˚	0.81				-	-	54	0.62	41	NX	NX		Grey	-		-	-	-	-	-	10.9	The Soft Rock encountered after 3.5m depth. The Rockmass encountered is Granitic Gneiss from 4.5m depth. Ground Water Level Encountered at 6.5m depth.
13.50	15.00	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	19˚	0.90				-	-	60	0.60	40				Grey	-		-	-	-	-	-	10.4	
15.00	16.50	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	12˚	1.11					-	74	0.87	58				Grey	-		-	-	-	-	-	10.0	
16.50	18.00	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	25˚	1.16					-	77	0.98	65				Grey	-		-	-	-	-	-	9.6	
18.00	19.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	15˚	1.26						84	1.20	80				Grey	-		-	-	-	-	-	8.6	
19.50	21.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	7˚	1.28						85	1.17	78				Grey	-		-	-	-	-	-	8.3	
21.00	22.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	10˚	1.29						86	0.98	65				Grey	-		-	-	-	-	-	8.1	
22.50	24.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	14˚	1.34						89	1.23	82				Grey	-		-	-	-	-	-	8.3	

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GEOLOGICAL LOG OF BOREHOLE: BH - 11

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Pwd Quarters, Siddapura, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	17.01.2025	COLLAR ELEVATION:		100.120	
COMPLETED	28.01.2025	Co-Ordinates:	Easting	780959.135	
TOTAL DEPTH	39m		Northing	1432551.46	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	'Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
24.00	25.50	Fresh, Granitic Gneiss		I	Strong Rock	23˚	1.32						88	1.32	88		NX		Grey		-	-	-	-	-	-	8.6	
25.50	27.00	Fresh, Granitic Gneiss		I	Strong Rock	25˚	1.41						94	1.41	94		NX		Grey		-	-	-	-	-	-	8.3	
27.00	28.50	Fresh, Granitic Gneiss		I	Strong Rock	12˚	1.43						95	1.43	95		NX		Grey		-	-	-	-	-	-	8.9	
28.50	30.00	Fresh, Granitic Gneiss		I	Strong Rock	14˚	1.49						99	1.49	99		NX		Grey		-	-	-	-	-	-	8.3	
30.00	31.50	Fresh, Granitic Gneiss		I	Strong Rock	19˚	1.49						99	1.49	99		NX		Grey		-	-	-	-	-	-	8.3	
31.50	33.00	Fresh, Granitic Gneiss		I	Very Strong Rock	15˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
33.00	34.50	Fresh, Granitic Gneiss		I	Very Strong Rock	15˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
34.50	36.00	Fresh, Granitic Gneiss		I	Very Strong Rock	10˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	

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GEOLOGICAL LOG OF BOREHOLE: BH - 11

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Pwd Quarters, Siddapura, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	17.01.2025	COLLAR ELEVATION:		100.120	
COMPLETED	28.01.2025	Co-Ordinates:	Easting	780959.135	
TOTAL DEPTH	39m		Northing	1432551.46	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery: TCR Length (m)	Core Recovery: 0-20	Core Recovery: 20-40	Core Recovery: 40-60	Core Recovery: 60-80	Core Recovery: 80-100	Core Recovery: TCR (%)	RQD: RQD (Length in m of core pieces>=10cm)	RQD: RQD %	Type of Bit	'Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss: Nill	Drill Water Loss: Partial	Drill Water Loss: Full	SPT: BLOWS/15CM)			SPT N Value (Blows/cm)	Penetration Rate (mm/min)	Special observations and interpretations
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
36.00	37.50	Fresh, Granitic Gneiss		I	Very Strong Rock	8°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
37.50	39.00	Fresh, Granitic Gneiss		I	Very Strong Rock	8°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	

SOIL		Disintegrated Rock		Granitic Gneseiss	

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GEOLOGICAL LOG OF BOREHOLE: BH - 13

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	NIMHANS, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT		
STARTED	23.01.2025	COLLAR ELEVATION:		100.12		
COMPLETED	31.01.2025	Co-Ordinates:	Easting	781490.312		
TOTAL DEPTH	75m		Northing	1431872.322		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	5	6	10	**16**	125.0	
1.50	3.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	9	12	17	**29**	125.0	
3.00	4.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	12	8	6	**14**	147.1	
4.50	6.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	50/ 11cm	R	R	**R**	71.4	
6.00	7.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 4cm	R	R	**R**	22.7	
7.50	9.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	∆ GWL-9.0m	Grey		-	-	50/ 3cm	R	R	**R**	19.2	
9.00	10.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 2cm	R	R	**R**	19.2	
10.50	12.00	Moderately Weathered, Granitic Gneiss		III	Weak Rock	8°	0.86				-	-	57	0.75	50		NX		Grey		-	-	-	-	-	-	11.9	
12.00	13.50	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	20°	1.22						81	1.13	75		NX		Grey		-	-	-	-	-	-	12.5	
13.50	15.00	Slightly Weathered, Granitic Gneiss		II	Strong Rock	11°	1.14					-	76	1.14	76		NX		Grey		-	-	-	-	-	-	10.4	
15.00	16.50	Fresh, Granitic Gneiss		I	Strong Rock	19°	1.13					-	75	1.10	73		NX		Grey		-	-	-	-	-	-	11.9	
16.50	18.00	Fresh, Granitic Gneiss		I	Strong Rock	24°	1.13					-	75	1.05	70		NX		Grey		-	-	-	-	-	-	11.9	
18.00	19.50	Fresh, Granitic Gneiss		I	Strong Rock	10°	1.11					-	74	1.11	74		NX		Grey		-	-	-	-	-	-	10.4	
19.50	21.00	Fresh, Granitic Gneiss		I	Strong Rock	10°	1.13					-	75	1.13	75		NX		Grey		-	-	-	-	-	-	10.4	
21.00	22.50	Fresh, Granitic Gneiss		I	Strong Rock	21°	1.19					-	79	1.19	79		NX		Grey		-	-	-	-	-	-	9.6	
22.50	24.00	Fresh, Granitic Gneiss		I	Very Strong Rock	24°	1.25						83	1.25	83		NX		Grey		-	-	-	-	-	-	8.9	

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

GEOLOGICAL LOG OF BOREHOLE: BH - 13

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	NIMHANS, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	23.01.2025	COLLAR ELEVATION:		100.12	
COMPLETED	31.01.2025	Co-Ordinates:	Easting	781490.312	
TOTAL DEPTH	75m		Northing	1431872.322	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
24.00	25.50	Fresh, Granitic Gneiss		I	Very Strong Rock	12°	1.47						98	1.47	98		NX		Grey		-	-	-	-	-	-	9.6		
25.50	27.00	Fresh, Granitic Gneiss		I	Very Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	9.3		
27.00	28.50	Fresh, Granitic Gneiss		I	Very Strong Rock	11°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.9		
28.50	30.00	Fresh, Granitic Gneiss		I	Very Strong Rock	9°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	10.0		
30.00	31.50	Fresh, Granitic Gneiss		I	Very Strong Rock	30°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	9.6		
31.50	33.00	Fresh, Granitic Gneiss		I	Very Strong Rock	26°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	9.3		
33.00	34.50	Fresh, Granitic Gneiss		I	Very Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	9.6		
34.50	36.00	Fresh, Granitic Gneiss		I	Very Strong Rock	19°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.9		
36.00	37.50	Fresh, Granitic Gneiss		I	Very Strong Rock	24°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.3		The Soft Rock encountered after 6.0m depth. The Rockmass encountered is Hard Granitic Gneiss from 10.5m depth. Ground Water Level Encountered at 9.0m depth.
37.50	39.00	Fresh, Granitic Gneiss		I	Very Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8		
39.00	40.50	Fresh, Granitic Gneiss		I	Very Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.3		
40.50	42.00	Fresh, Granitic Gneiss		I	Very Strong Rock	25°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.1		
42.00	43.50	Fresh, Granitic Gneiss		I	Very Strong Rock	23°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8		
43.50	45.00	Fresh, Granitic Gneiss		I	Very Strong Rock	5°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.4		
45.00	46.50	Fresh, Granitic Gneiss		I	Very Strong Rock	8°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8		
46.50	48.00	Fresh, Granitic Gneiss		I	Very Strong Rock	14°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.1		

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GEOLOGICAL LOG OF BOREHOLE: BH - 13

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	NIMHANS, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	23.01.2025	COLLAR ELEVATION:		100.12	
COMPLETED	31.01.2025	Co-Ordinates:	Easting	781490.312	
TOTAL DEPTH	75m		Northing	1431872.322	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
48.00	49.50	Fresh, Granitic Gneiss		I	Very Strong Rock	20°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.3	
49.50	51.00	Fresh, Granitic Gneiss		I	Very Strong Rock	16°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.3	
51.00	52.50	Fresh, Granitic Gneiss		I	Very Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8	
52.50	54.00	Fresh, Granitic Gneiss		I	Very Strong Rock	14°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.4	
54.00	55.50	Fresh, Granitic Gneiss		I	Very Strong Rock	13°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8	
55.50	57.00	Fresh, Granitic Gneiss		I	Very Strong Rock	19°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.1	
57.00	58.50	Fresh, Granitic Gneiss		I	Very Strong Rock	19°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.1	
58.50	60.00	Fresh, Granitic Gneiss		I	Very Strong Rock	5°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8	
60.00	61.50	Fresh, Granitic Gneiss		I	Very Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.3	
61.50	63.00	Fresh, Granitic Gneiss		I	Very Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.6	
63.00	64.50	Fresh, Granitic Gneiss		I	Very Strong Rock	4°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.1	
64.50	66.00	Fresh, Granitic Gneiss		I	Very Strong Rock	13°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.3	
66.00	67.50	Fresh, Granitic Gneiss		I	Very Strong Rock	16°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.3	
67.50	69.00	Fresh, Granitic Gneiss		I	Very Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8	
69.00	70.50	Fresh, Granitic Gneiss		I	Very Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.4	
70.50	72.00	Fresh, Granitic Gneiss		I	Very Strong Rock	8°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

GEOLOGICAL LOG OF BOREHOLE: BH - 13

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	NIMHANS, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	23.01.2025	COLLAR ELEVATION:		100.12	
COMPLETED	31.01.2025	Co-Ordinates:	Easting	781490.312	
TOTAL DEPTH	75m		Northing	1431872.322	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT					Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)	Penetration Rate (mm/min)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
72.00	73.50	Fresh, Granitic Gneiss		I	Very Strong Rock	12°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.6	
73.50	75.00	Fresh, Granitic Gneiss		I	Very Strong Rock	5°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.6	

SOIL | Disintegrated Rock | Granitic Gneseiss

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

GEOLOGICAL LOG OF BOREHOLE: BH - 14

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Govt ITI College, Dairy Circle, Hosur Road, Bengaluru.	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	09.02.2025	COLLAR ELEVATION:	100.12		
COMPLETED	24.02.2025	Co-Ordinates: Easting	782127.304		
TOTAL DEPTH	70m	Northing	1431516.247		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	7	9	12	**21**	166.7	
1.50	3.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	7	12	16	**28**	104.2	
3.00	4.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	8	12	15	**27**	83.3	
4.50	6.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	9	15	23	**38**	69.4	
6.00	7.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	7	9	11	**20**	80.6	
7.50	9.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	9	12	16	**28**	75.8	
9.00	10.50	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	12	13	17	**30**	75.8	
10.50	12.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	-		NX	-	Grey		-	-	11	15	19	**34**	71.4	
12.00	13.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-		NX	Δ GWL-13m	Grey		-	-	43	50/ 9cm	R	**R**	61.0	
13.50	15.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 12cm	R	R	**R**	59.5	
15.00	16.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 3cm	R	R	**R**	40.3	
16.50	18.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey	-		-	50/ 2cm	R	R	**R**	33.8	
18.00	19.50	Moderately Weathered, Granitic Gneiss		III	Medium Strong Rock	11°	0.26		-	-	-	-	17	0.00	0		NX		Grey	-		-	-	-	-	-	-	11.9	
19.50	21.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	14°	1.31						87	1.31	87		NX		Grey	-		-	-	-	-	-	-	12.5	
21.00	22.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	21°	1.35						90	1.35	90		NX		Grey		-	-	-	-	-	-	-	11.4	
22.50	24.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	19°	1.47						98	1.47	98		NX		Grey		-	-	-	-	-	-	-	10.9	
24.00	25.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	15°	1.40						93	1.40	93		NX		Grey		-	-	-	-	-	-	-	11.4	
25.50	27.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	8°	1.40						93	1.40	93		NX		Grey		-	-	-	-	-	-	-	10.9	

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GEOLOGICAL LOG OF BOREHOLE: BH - 14

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Govt ITI College, Dairy Circle, Hosur Road, Bengaluru.	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	09.02.2025	COLLAR ELEVATION:	100.12		
COMPLETED	24.02.2025	Co-Ordinates: Easting	782127.304		
TOTAL DEPTH	70m	Northing	1431516.247		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
27.00	28.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	17°	1.37						91	1.37	91		NX		Grey		-	-	-	-	-	-	10.0	
28.50	30.00	Fresh, Granitic Gneiss		I	Strong Rock	11°	1.41						94	1.41	94		NX		Grey		-	-	-	-	-	-	9.6	
30.00	31.50	Fresh, Granitic Gneiss		I	Strong Rock	24°	1.44						96	1.44	96		NX		Grey		-	-	-	-	-	-	10.4	
31.50	33.00	Fresh, Granitic Gneiss		I	Strong Rock	16°	1.44						96	1.44	96		NX		Grey		-	-	-	-	-	-	10.0	
33.00	34.50	Fresh, Granitic Gneiss		I	Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	9.6	
34.50	36.00	Fresh, Granitic Gneiss		I	Strong Rock	10°	1.50						100	1.50	100	NX	NX		Grey		-	-	-	-	-	-	9.6	The Soft Rock encountered after 15.5m depth. The Rockmass encountered is Hard Granitic Gneiss from 18.0m depth. Ground Water Level Encountered at 13.0m depth.
36.00	37.50	Fresh, Granitic Gneiss		I	Strong Rock	13°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	9.3	
37.50	39.00	Fresh, Granitic Gneiss		I	Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.6	
39.00	40.50	Fresh, Granitic Gneiss		I	Strong Rock	12°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	9.3	
40.50	42.00	Fresh, Granitic Gneiss		I	Strong Rock	17°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.9	
42.00	43.50	Fresh, Granitic Gneiss		I	Strong Rock	24°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.6	
43.50	45.00	Fresh, Granitic Gneiss		I	Strong Rock	26°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.9	
45.00	46.50	Fresh, Granitic Gneiss		I	Strong Rock	9°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.6	

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GEOLOGICAL LOG OF BOREHOLE: BH - 14

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Govt ITI College, Dairy Circle, Hosur Road, Bengaluru.	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	09.02.2025	COLLAR ELEVATION:	100.12		
COMPLETED	24.02.2025	Co-Ordinates: Easting	782127.304		
TOTAL DEPTH	70m	Northing	1431516.247		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
46.50	48.00	Fresh, Granitic Gneiss		I	Strong Rock	10°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.1	
48.00	49.50	Fresh, Granitic Gneiss		I	Very Strong Rock	10°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8	
49.50	51.00	Fresh, Granitic Gneiss		I	Very Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8	
51.00	52.50	Fresh, Granitic Gneiss		I	Very Strong Rock	8°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.6	
52.50	54.00	Fresh, Granitic Gneiss		I	Very Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
54.00	55.50	Fresh, Granitic Gneiss		I	Very Strong Rock	16°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
55.50	57.00	Fresh, Granitic Gneiss		I	Very Strong Rock	12°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
57.00	58.50	Fresh, Granitic Gneiss		I	Very Strong Rock	13°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
58.50	60.00	Fresh, Granitic Gneiss		I	Very Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.4	
60.00	61.50	Fresh, Granitic Gneiss		I	Very Strong Rock	10°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
61.50	63.00	Fresh, Granitic Gneiss		I	Very Strong Rock	11°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
63.00	64.50	Fresh, Granitic Gneiss		I	Very Strong Rock	9°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
64.50	66.00	Fresh, Granitic Gneiss		I	Very Strong Rock	19°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.6	
66.00	67.50	Fresh, Granitic Gneiss		I	Very Strong Rock	24°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
67.50	69.00	Fresh, Granitic Gneiss		I	Very Strong Rock	11°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
69.00	70.00	Fresh, Granitic Gneiss		I	Very Strong Rock	8°	1.00						100	1.00	100		NX		Grey		-	-	-	-	-	-	4.6	

SOIL		Disintegrated Rock		Granitic Gneseiss	

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

GEOLOGICAL LOG OF BOREHOLE: BH - 15

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Christ Univercity, Hosur Road, Bengaluru.	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90^{o}	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	11.02.2025	COLLAR ELEVATION:	100.12		
COMPLETED	23.02.2025	Co-Ordinates: Easting	782592.586		
TOTAL DEPTH	60m	Northing	1431335.927		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	**15cm**	**30cm**	**45cm**	**"N"**		
0.00	1.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	3	5	5	**10**	166.7	
1.50	3.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	7	9	11	**20**	100.0	
3.00	4.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	10	13	50/ 10cm	**R**	55.6	
4.50	6.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	Δ GWL-5m	Grey		-	-	50/ 5cm	R	R	**R**	48.1	
6.00	7.50	Moderately Weathered, Granitic Gneiss		III	Weak Rock	24˚	0.56			-	-	-	37	0.26	17		NX		Grey	-		-	-	-	-	-	20.0	
7.50	9.00	Moderately Weathered, Granitic Gneiss		III	Weak Rock	30˚	0.66				-	-	44	0.23	15		NX		Grey	-		-	-	-	-	-	17.7	
9.00	10.50	Completley Weathered, Granitic Gneiss		V	Weak Rock	31˚	0.06		-	-	-	-	4	0.00	0		NX		Grey	-	-		-	-	-	-	45.5	
10.50	12.00	Completley Weathered, Granitic Gneiss		V	Medium Strong	33˚	0.08		-	-	-	-	5	0.00	0		NX		Grey	-	-		-	-	-	-	35.7	
12.00	13.50	Highly Weathered, Granitic Gneiss		IV	Medium Strong	28˚	0.45			-	-	-	30	0.29	19		NX		Grey	-	-		-	-	-	-	22.7	
13.50	15.00	Slightly Weathered, Granitic Gneiss		II	Medium Strong	23˚	0.98					-	65	0.98	65		NX		Grey	-		-	-	-	-	-	13.9	
15.00	16.50	Fresh, Granitic Gneiss		I	Medium Strong	15˚	1.26						84	1.26	84		NX		Grey	-		-	-	-	-	-	13.2	
16.50	18.00	Fresh, Granitic Gneiss		I	Medium Strong	17˚	1.23						82	0.87	58		NX		Grey	-		-	-	-	-	-	12.5	
18.00	19.50	Fresh, Granitic Gneiss		I	Medium Strong	10˚	1.20						80	1.20	80		NX		Grey	-		-	-	-	-	-	11.9	
19.50	21.00	Fresh, Granitic Gneiss		I	Strong Rock	10˚	1.20						80	1.20	80		NX		Grey	-		-	-	-	-	-	12.5	
21.00	22.50	Fresh, Granitic Gneiss		I	Strong Rock	16˚	1.19						79	1.19	79		NX		Grey	-		-	-	-	-	-	13.2	
22.50	24.00	Fresh, Granitic Gneiss		I	Strong Rock	24˚	1.13						75	1.13	75		NX		Grey	-		-	-	-	-	-	13.9	

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

GEOLOGICAL LOG OF BOREHOLE: BH - 15

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Christ Univercity, Hosur Road, Bengaluru.	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90^{o}	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	11.02.2025	COLLAR ELEVATION:	100.12		
COMPLETED	23.02.2025	Co-Ordinates: Easting	782592.586		
TOTAL DEPTH	60m	Co-Ordinates: Northing	1431335.927		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
24.00	25.50	Fresh, Granitic Gneiss		I	Strong Rock	17˚	1.23						82	1.23	82		NX		Grey		-	-	-	-	-	-	13.2	
25.50	27.00	Fresh, Granitic Gneiss		I	Strong Rock	23˚	1.22						81	1.22	81		NX		Grey		-	-	-	-	-	-	12.5	
27.00	28.50	Fresh, Granitic Gneiss		I	Very Strong Rock	24˚	1.25						83	1.25	83		NX		Grey		-	-	-	-	-	-	13.2	
28.50	30.00	Fresh, Granitic Gneiss		I	Very Strong Rock	28˚	1.40						93	1.40	93		NX		Grey		-	-	-	-	-	-	11.9	
30.00	31.50	Fresh, Granitic Gneiss		I	Very Strong Rock	27˚	1.47						98	1.47	98	NX	NX		Grey		-	-	-	-	-	-	10.9	The Rockmass encountered is Hard Granitic Gneiss from 6.0m depth. Ground Water Level Encountered at 5.0m depth.
31.50	33.00	Fresh, Granitic Gneiss		I	Very Strong Rock	19˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	10.4	
33.00	34.50	Fresh, Granitic Gneiss		I	Very Strong Rock	17˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	9.6	
34.50	36.00	Fresh, Granitic Gneiss		I	Very Strong Rock	10˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.9	
36.00	37.50	Fresh, Granitic Gneiss		I	Very Strong Rock	9˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.6	
37.50	39.00	Fresh, Granitic Gneiss		I	Very Strong Rock	12˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.1	
39.00	40.50	Fresh, Granitic Gneiss		I	Very Strong Rock	14˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.4	
40.50	42.00	Fresh, Granitic Gneiss		I	Very Strong Rock	27˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8	
42.00	43.50	Fresh, Granitic Gneiss		I	Very Strong Rock	20˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.1	
43.50	45.00	Fresh, Granitic Gneiss		I	Very Strong Rock	23˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
45.00	46.50	Fresh, Granitic Gneiss		I	Very Strong Rock	24˚	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

GEOLOGICAL LOG OF BOREHOLE: BH - 15

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Christ Univercity, Hosur Road, Bengaluru.	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	11.02.2025	COLLAR ELEVATION:	100.12		
COMPLETED	23.02.2025	Co-Ordinates: Easting	782592.586		
TOTAL DEPTH	60m	Northing	1431335.927		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT					Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)	Penetration Rate (mm/min)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
46.50	48.00	Fresh, Granitic Gneiss		I	Very Strong Rock	24°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
48.00	49.50	Fresh, Granitic Gneiss		I	Very Strong Rock	11°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.4	
49.50	51.00	Fresh, Granitic Gneiss		I	Very Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
51.00	52.50	Fresh, Granitic Gneiss		I	Very Strong Rock	8°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
52.50	54.00	Fresh, Granitic Gneiss		I	Very Strong Rock	12°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
54.00	55.50	Fresh, Granitic Gneiss		I	Very Strong Rock	13°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.4	
55.50	57.00	Fresh, Granitic Gneiss		I	Very Strong Rock	12°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
57.00	58.50	Fresh, Granitic Gneiss		I	Very Strong Rock	10°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
58.50	60.00	Fresh, Granitic Gneiss		I	Very Strong Rock	10°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	

SOIL		Disintegrated Rock		Granitic Gneseiss	

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

GEOLOGICAL LOG OF BOREHOLE: BH - 16

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	St Johns Staff Quarters, Bengaluru	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	01.02.2025	COLLAR ELEVATION:	100.12		
COMPLETED	11.02.2025	Co-Ordinates: Easting	783433.917		
TOTAL DEPTH	36.00	Northing	1430910.445		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	**15cm**	**30cm**	**45cm**	**"N"**		
0.00	1.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	10	12	16	**28**	83.3	
1.50	3.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	9	16	24	**40**	80.6	
3.00	4.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	50/ 13cm	R	R	**R**	73.5	
4.50	6.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	7	14	21	**35**	83.3	
6.00	7.50	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	10	16	26	**42**	78.1	
7.50	9.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	11	20	42	**62**	78.1	
9.00	10.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	32	50/ 10cm	R	**R**	71.4	
10.50	12.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-		NX	Δ GWL-12m	Grey		-	-	13	21	31	**52**	71.4	
12.00	13.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	28	50/ 10cm	R	**R**	69.4	
13.50	15.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	10	15	26	**41**	75.8	

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GEOLOGICAL LOG OF BOREHOLE: BH - 16

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	St Johns Staff Quarters, Bengaluru	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	01.02.2025	COLLAR ELEVATION:	100.12		
COMPLETED	11.02.2025	Co-Ordinates: Easting	783433.917		
TOTAL DEPTH	36.00	Northing	1430910.445		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	**15cm**	**30cm**	**45cm**	**"N"**		
15.00	16.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	12	18	32	**50**	71.4	The Soft Rock encountered after 16.5m depth. The Rockmass encountered is Hard Granitic Gneiss from 19.5m depth. Ground Water Level Encountered at 12.0m depth.
16.50	18.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 5cm	R	R	**R**	61.0	
18.00	19.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-	NX	NX		Grey		-	-	50/ 2cm	R	R	**R**	59.5	
19.50	21.00	Highly Weathered, Granitic Gneiss		IV	Weak Rock	17˚	0.32			-	-	-	21	0.00	0		NX		Grey		-	-	-	-	-	-	15.6	
21.00	22.50	Moderately Weathered, Granitic Gneiss		III	Weak Rock	23˚	0.51			-	-	-	34	0.42	28		NX		Grey	-		-	-	-	-	-	15.6	
22.50	24.00	Moderately Weathered, Granitic Gneiss		III	Weak Rock	19˚	0.53			-	-	-	35	0.45	30		NX		Grey	-		-	-	-	-	-	15.2	

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GEOLOGICAL LOG OF BOREHOLE: BH - 16

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	St Johns Staff Quarters, Bengaluru	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	01.02.2025	COLLAR ELEVATION:	100.12		
COMPLETED	11.02.2025	Co-Ordinates: Easting	783433.917		
TOTAL DEPTH	36.00	Northing	1430910.445		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
24.00	25.50	Moderately Weathered, Granitic Gneiss		III	Weak Rock	27˚	0.32			-	-	-	21	0.00	0		NX		Grey	-	-		-	-	-	-	14.7	
25.50	27.00	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	17˚	0.33			-	-	-	22	0.18	12		NX		Grey	-	-		-	-	-	-	14.4	
27.00	28.50	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	17˚	0.41			-	-	-	27	0.41	27		NX		Grey	-		-	-	-	-	-	14.5	
28.50	30.00	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	17˚	0.62				-	-	41	0.62	41		NX		Grey		-	-	-	-	-	-	13.2	
30.00	31.50	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	17˚	0.78				-	-	52	0.78	52		NX		Grey		-	-	-	-	-	-	13.3	
31.50	33.00	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	17˚	0.93					-	62	0.93	62		NX		Grey		-	-	-	-	-	-	13.2	
33.00	34.50	Fresh, Granitic Gneiss		I	Strong Rock	17˚	0.96					-	64	0.96	64		NX		Grey		-	-	-	-	-	-	12.9	
34.50	36.00	Fresh, Granitic Gneiss		I	Strong Rock	12˚	1.17					-	78	1.17	78		NX		Grey		-	-	-	-	-	-	12.8	

SOIL | Disintegrated Rock | Granitic Gneseiss

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

GEOLOGICAL LOG OF BOREHOLE: BH - 17

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	St Johns Staff Quarters, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	12.02.2025	COLLAR ELEVATION:		100.12	
COMPLETED	17.02.2025	Co-Ordinates:	Easting	783651.014	
TOTAL DEPTH	36.00		Northing	1430692.502	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT			SPT N Value (Blows/cm)	Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	7	9	11	**20**	125.0	
1.50	3.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	10	15	19	**34**	104.2	
3.00	4.50	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	12	17	22	**39**	83.3	
4.50	6.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	10	16	18	**34**	75.8	
6.00	7.50	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	12	20	22	**42**	73.5	
7.50	9.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	9	17	22	**39**	71.4	
9.00	10.50	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	10	18	25	**43**	69.4	
10.50	12.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	-		NX	-	Grey		-	-	8	12	15	**27**	75.8	
12.00	13.50	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	-		NX	-	Grey		-	-	9	14	19	**33**	69.4	

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GEOLOGICAL LOG OF BOREHOLE: BH - 17

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	St Johns Staff Quarters, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	12.02.2025	COLLAR ELEVATION:		100.12	
COMPLETED	17.02.2025	Co-Ordinates:	Easting	783651.014	
TOTAL DEPTH	36.00		Northing	1430692.502	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT			SPT N Value (Blows/cm)	Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
13.50	15.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-	NX	NX	-	Grey		-	-	41	50/ 10cm	R	R	67.6	The Soft Rock encountered after 16.5m depth. Ground water is not encountered.
15.00	16.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	-			-	Grey		-	-	12	18	32	50	65.8	
16.50	18.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-			-	Grey		-	-	50/ 5cm	R	R	R	59.5	
18.00	19.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-			-	Grey		-	-	50/ 2cm	R	R	R	61.0	
19.50	21.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-			-	Grey		-	-	50/ 2cm	R	R	R	58.1	
21.00	22.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-			-	Grey		-	-	50/ 2cm	R	R	R	55.6	
22.50	24.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-			-	Grey		-	-	50/ 2cm	R	R	R	54.3	
24.00	25.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-			-	Grey		-	-	50/ 2cm	R	R	R	55.6	

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

GEOLOGICAL LOG OF BOREHOLE: BH - 17

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	St Johns Staff Quarters, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	12.02.2025	COLLAR ELEVATION:		100.12	
COMPLETED	17.02.2025	Co-Ordinates:	Easting	783651.014	
TOTAL DEPTH	36.00		Northing	1430692.502	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT			SPT N Value (Blows/cm)	Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
25.50	27.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX	-	Grey		-	-	50/ 2cm	R	R	**R**	52.1	
27.00	28.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX	-	Grey		-	-	50/ 2cm	R	R	**R**	51.0	
28.50	30.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX	-	Grey		-	-	50/ 2cm	R	R	**R**	50.0	

SOIL		Disintegrated Rock		Granitic Gneseiss

APPENDIX-B

Laboratory Test Results of Soil/Rock Samples

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

PHYSICAL PROPERTIES OF SOIL as per IS : 2720

Borehole No	Depth (m)	Grain size analysis					Atterberg Limits			Description of Soil	Insitu moisture content	Bulk Density	Specific Gravity	Free Swell Index	Shear Strength Parameters	
		Gravel	Sand			Silt & Clay	Liquid Limts	Plastic Limits	Plasticity Index						Cohesive Strength (c)	Angle of Internal Friction (φ)
			e	Medium	Fine											
		%	%	%	%	%	%	%	%		%	gm/cc		%	(kg/cm^2)	(Deg)
BH-03	1.5	0.7	2.3	37.3	24.5	**35**	32	27	5	Silty SAND	2.41	1.82	2.62	10.0	0.01	24
BH-03	3.0	9	3.5	43.1	22.9	**22**	28	NP	NP	Silty SAND	3.25	1.86	2.63	0.0	0	25
BH-03	4.5	10.8	4.7	40	21.3	**23**	29	NP	NP	Silty SAND	4.78	1.95	2.63	0.0	0	27
BH-05	1.5	14.9	14.15	31.92	20.81	**18**	36	28	8	Silty SAND	2.99	1.81	2.65	10.0	0.03	23
BH-05	3.0	3.5	6.49	41.61	21.28	**27**	32	27	5	Silty SAND	3.45	1.92	2.64	8.0	0.01	26
BH-05	4.5	1.22	7	43.78	24.76	**23**	28	NP	NP	Silty SAND	5.12	2.00	2.65	0.0	0	29
BH-05	6.0	1.11	2.18	37.45	37.79	**21**	27	NP	NP	Silty SAND	5.80	2.06	2.65	0.0	0	30
BH-08	1.5	2.9	5.4	54.1	34.1	**3**	34	27	7	Silty SAND	5.23	1.84	2.66	0.0	0	24
BH-08	3.0	1.1	0.6	17.8	39.65	**41**	35	26	9	Silty SAND	11.32	1.90	2.63	10.0	0	26
BH-09	1.5	0.69	0.3	14.16	40.54	**44**	35	28	7	Silty SAND	2.58	1.80	2.64	15.0	0.11	21
BH-09	3.0	12.32	4.13	12.04	33.18	**38**	35	28	7	Silty SAND	4.05	1.84	2.65	10.0	0.12	24
BH-09	4.5	11.37	5.24	17.17	32.18	**34**	33	NP	NP	Silty SAND	5.27	1.85	2.63	0.0	0	25
BH-09	6.0	3.76	5.52	17.23	33.13	**40**	31	NP	NP	Silty SAND	6.89	1.87	2.63	0.0	0	25

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No	Depth (m)	Grain size analysis					Atterberg Limits			Description of Soil	Insitu moisture content	Bulk Density	Specific Gravity	Free Swell Index	Shear Strength Parameters	
		Gravel	Sand			Silt & Clay	Liquid Limts	Plastic Limits	Plasticity Index						Cohesive Strength (c)	Angle of Internal Friction (φ)
			e	Medium	Fine											
		%	%	%	%	%	%	%	%		%	gm/cc		%	(kg/cm^2)	(Deg)
BH-09	7.5	6.9	7.1	31.89	21.99	**32**	31	NP	NP	Silty SAND	8.55	1.91	2.65	0.0	0	26
BH-09	9.0	1.35	4.37	34.57	22.98	**37**	34	NP	NP	Silty SAND	13.52	1.93	2.65	0.0	0	27
BH-09	10.5	13.46	4.28	30.82	21.96	**29**	34	NP	NP	Silty SAND	15.09	1.99	2.65	0.0	0	27
BH-09	12.0	11.05	3.45	28.41	27.63	**29**	34	NP	NP	Silty SAND	15.11	2.00	2.64	0.0	0	28
BH-09	13.5	5.55	4.85	23.86	25.09	**41**	27	NP	NP	Silty SAND	16.21	2.04	2.64	0.0	0	29
BH-09	15.0	6.81	4.26	24.57	26.68	**38**	28	NP	NP	Silty SAND	16.42	2.10	2.63	0.0	0	30
BH-09	16.5	7.85	1.33	29.12	23.42	**38**	27	NP	NP	Silty SAND	16.85	2.13	2.65	0.0	0	31
BH-11	1.5	1.24	2.33	21.47	28.5	**46**	34	27	7	Silty SAND	3.05	1.78	2.63	10.0	0	23
BH-11	3.0	4.1	3.7	26.52	28.9	**37**	32	NP	NP	Silty SAND	3.92	1.96	2.64	0.0	0	27
BH-13	1.5	6.4	9.6	27.3	22.3	**34**	31	25	6	Silty SAND	1.95	1.77	2.64	0.0	0.03	21
BH-13	3.0	0.4	2.7	37.6	30.1	**29**	27	NP	NP	Silty SAND	2.52	1.80	2.65	0.0	0.01	23
BH-13	4.5	5.7	4.9	35.9	26.5	**27**	27	NP	NP	Silty SAND	4.93	1.84	2.65	0.0	0	24
BH-13	6.0	6.4	11.9	39.2	21.3	**21**	30	NP	NP	Silty SAND	5.13	2.00	2.66	0.0	0	28
BH-14	1.5	0.2	2.1	30.8	30.3	**37**	38	29	9	Silty SAND	3.19	1.83	2.63	0.0	0.02	24
BH-14	3.0	1.7	1.1	33.3	24.1	**40**	33	NP	NP	Silty SAND	5.26	1.85	2.62	0.0	0	25

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No	Depth (m)	Grain size analysis					Atterberg Limits			Description of Soil	Insitu moisture content	Bulk Density	Specific Gravity	Free Swell Index	Shear Strength Parameters	
		Gravel	Sand			Silt & Clay	Liquid Limts	Plastic Limits	Plasticity Index						Cohesive Strength (c)	Angle of Internal Friction (φ)
			e	Medium	Fine											
		%	%	%	%	%	%	%	%		%	gm/cc		%	(kg/cm^2)	(Deg)
BH-14	4.5	0	0.4	46.4	20.6	**33**	32	NP	NP	Silty SAND	5.81	1.85	2.66	0.0	0	25
BH-14	6.0	0.2	0.4	34.8	24.9	**40**	32	NP	NP	Silty SAND	6.44	1.86	2.62	0.0	0	25
BH-14	7.5	0	0.4	39.3	21.7	**39**	32	NP	NP	Silty SAND	8.78	1.86	2.63	0.0	0	25
BH-14	9.0	0.2	0.8	38.9	22.1	**38**	30	NP	NP	Silty SAND	9.23	1..89	2.63	0.0	0	26
BH-14	10.5	0.4	1.3	35.1	25.3	**38**	28	NP	NP	Silty SAND	9.54	1.91	2.63	0.0	0	27
BH-14	12.0	0.4	1.1	36.6	21.9	**40**	28	NP	NP	Silty SAND	10.20	1.93	2.63	0.0	0	27
BH-14	13.5	0.4	1	33.4	31.1	**34**	28	NP	NP	Silty SAND	10.62	2.04	2.63	0.0	0	28
BH-14	15.0	0	1.2	38.9	24.1	**36**	28	NP	NP	Silty SAND	13.83	2.10	2.65	0.0	0	30
BH-15	1.5	0.4	1.4	21.6	27.7	**49**	34	27	7	Silty SAND	1.45	1.82	2.65	0.0	0.01	24
BH-15	3.0	1	0.8	30.6	26.3	**41**	34	27	7	Silty SAND	2.11	1.86	2.63	0.0	0	25
BH-15	4.5	0	0.6	29	33	**37**	29	NP	NP	Silty SAND	6.50	1.99	2.64	0.0	0	28
BH-15	6.0	0	0.2	28.9	39.4	**32**	27	NP	NP	Silty SAND	10.45	2.08	2.65	0.0	0	30
BH-16	1.5	14.4	3.3	12.5	26.4	**43**	39	28	11	Silty SAND	4.73	1.85	2.64	15.0	0	25
BH-16	3.0	1.2	3.7	42.9	22	**30**	36	28	8	Silty SAND	5.05	1.92	2.65	15.0	0	27
BH-16	4.5	0	1.4	37.5	26	**35**	36	28	8	Silty SAND	5.24	1.91	2.65	15.0	0	27

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No	Depth (m)	Grain size analysis					Atterberg Limits			Description of Soil	Insitu moisture content	Bulk Density	Specific Gravity	Free Swell Index	Shear Strength Parameters	
		Gravel	Sand			Silt & Clay	Liquid Limts	Plastic Limits	Plasticity Index						Cohesive Strength (c)	Angle of Internal Friction (φ)
			e	Medium	Fine											
		%	%	%	%	%	%	%	%		%	gm/cc		%	(kg/cm^2)	(Deg)
BH-16	6.0	0	0.7	31	14.8	**54**	32	NP	NP	Sandy SILT	5.98	1.92	2.62	0.0	0	27
BH-16	7.5	0.6	0.8	30.3	14.7	**54**	32	NP	NP	Sandy SILT	6.27	2.00	2.61	0.0	0	28
BH-16	9.0	0	1.2	31.4	15.9	**52**	35	NP	NP	Sandy SILT	8.43	2.08	2.62	0.0	0	29
BH-16	10.5	0	0.6	29.1	17	**53**	34	NP	NP	Sandy SILT	8.52	2.14	2.61	0.0	0	30
BH-16	12.0	1	1.8	39.4	16.7	**41**	27	NP	NP	Silty SAND	10.00	2.16	2.62	0.0	0	31
BH-16	13.5	0.4	1.3	40.7	19.3	**38**	31	NP	NP	Silty SAND	12.25	2.21	2.63	10.0	0	32
BH-16	15.0	0.5	0.7	42.6	20.8	**35**	31	NP	NP	Silty SAND	14.83	2.21	2.65	0.0	0	32
BH-16	16.5	0.4	1.1	38.2	19.3	**41**	28	NP	NP	Silty SAND	15.74	2.23	2.63	0.0	0	32
BH-17	1.5	0	0.2	16.4	43.2	**40**	38	26	12	Silty SAND	2.01	1.85	2.64	12.0	0	25
BH-17	3.0	0	0.4	44.1	23.3	**32**	37	28	9	Silty SAND	2.32	1.88	2.65	15.0	0	26
BH-17	4.5	5.6	6.2	25.9	20.9	**41**	37	28	9	Silty SAND	2.85	1.88	2.65	15.0	0	26
BH-17	6.0	2.1	8.9	45.5	11.8	**32**	33	25	8	Silty SAND	3.46	1.89	2.65	10.0	0	26
BH-17	7.5	2.6	5.4	28.7	14.8	**49**	33	NP	NP	Silty SAND	4.70	1.91	2.63	0.0	0	27
BH-17	9.0	0.5	4.8	37	14.5	**43**	33	NP	NP	Silty SAND	4.69	1.90	2.64	0.0	0	27
BH-17	10.5	1.14	5	34.7	14.2	**45**	33	NP	NP	Silty SAND	4.83	1.91	2.63	0.0	0	27

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No	Depth (m)	Grain size analysis					Atterberg Limits			Description of Soil	Insitu moisture content	Bulk Density	Specific Gravity	Free Swell Index	Shear Strength Parameters	
		Gravel	Sand			Silt & Clay	Liquid Limts	Plastic Limits	Plasticity Index						Cohesive Strength (c)	Angle of Internal Friction (φ)
			e	Medium	Fine											
		%	%	%	%	%	%	%	%		%	gm/cc		%	(kg/cm^2)	(Deg)
BH-17	12.0	2.3	5.7	29.7	13.3	**49**	35	NP	NP	Silty SAND	5.14	1.90	2.62	0.0	0	27
BH-17	15.0	0.9	2.3	38.5	14.1	**44**	27	NP	NP	Silty SAND	6.78	2.00	2.62	0.0	0	28
BH-17	16.5	1.3	9.6	47.9	12.3	**29**	27	NP	NP	Silty SAND	7.24	2.05	2.65	0.0	0	29

PHYSICAL PROPERTIES OF ROCK CORES (UCC) as per IS :9143, 13030,1124

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-03 7.5-9.0	54.0	2290.22	85	490	24	10.48	**9.99**	2.52	0.2	0.5	-	-
BH-03 9.0-10.5	54.0	2290.22	110	662	45	19.65	**19.73**	2.63	0.1	0.4	-	-
BH-03 10.5-12.0	54.0	2290.22	113	690	54	23.58	**23.82**	2.67	0.1	0.3	-	-
BH-03 12.0-13.5	54.0	2290.22	110	674	72	31.44	**31.56**	2.68	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-03 13.5-15.0	54.0	2290.22	111	683	84	36.68	**36.90**	2.69	0.0	0.0	-	-
BH-03 15.0-16.5	54.0	2290.22	90	550	65	28.38	**27.35**	2.67	0.2	0.8	-	-
BH-03 16.5-18.0	54.0	2290.22	110	676	98	42.79	**42.96**	2.68	0.0	0.0	-	-
BH-03 18.0-19.5	54.0	2290.22	112	690	126	55.02	**55.46**	2.69	0.0	0.0	-	-
BH-03 19.5-21.0	54.0	2290.22	115	714	139	60.69	**61.55**	2.71	0.0	0.0	-	-
BH-03 21.0-22.5	54.0	2290.22	110	692	143	62.44	**62.69**	2.75	0.0	0.0	-	-
BH-03 22.5-24.0	54.0	2290.22	108	669	157	68.55	**68.55**	2.70	0.0	0.0	-	-
BH-03 24.0-25.5	54.0	2290.22	112	699	160	69.86	**70.42**	2.72	0.0	0.2	-	-
BH-03 25.5-27.0	54.0	2290.22	113	705	175	76.41	**77.18**	2.72	0.0	0.4	-	-
BH-03 27.0-28.5	54.0	2290.22	110	685	180	78.60	**78.91**	2.72	0.0	0.0	-	-
BH-03 28.5-30.0	54.0	2290.22	110	690	196	85.58	**85.93**	2.74	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-03 30.0-31.5	54.0	2290.22	110	694	214	93.44	**93.82**	2.75	0.0	0.0	-	-
BH-03 31.5-33.0	54.0	2290.22	110	695	225	98.24	**98.64**	2.76	0.0	0.0	-	-
BH-03 33.0-34.5	54.0	2290.22	110	699	238	103.92	**104.34**	2.77	0.0	0.0	-	-
BH-03 34.5-36.0	54.0	2290.22	110	696	241	105.23	**105.65**	2.76	0.0	0.0	-	-
BH-03 36.0-37.5	54.0	2290.22	110	698	246	107.41	**107.85**	2.77	0.0	0.0	-	-
BH-03 37.5-39.0	54.0	2290.22	110	690	250	109.16	**109.60**	2.74	0.0	0.0	-	-
BH-03 39.0-40.5	54.0	2290.22	110	695	248	108.29	**108.72**	2.76	0.0	0.0	-	-
BH-03 40.5-42.0	54.0	2290.22	110	696	249	108.72	**109.16**	2.76	0.0	0.0	-	-
BH-03 42.0-43.5	54.0	2290.22	110	693	252	110.03	**110.48**	2.75	0.0	0.0	-	-
BH-03 43.5-45.0	54.0	2290.22	110	694	256	111.78	**112.23**	2.75	0.0	0.0	-	-
BH-03 45.0-46.5	54.0	2290.22	110	696	264	115.27	**115.74**	2.76	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-03 46.5-48.0	54.0	2290.22	110	698	275	120.08	**120.56**	2.77	0.0	0.0	-	-
BH-03 48.0-49.5	54.0	2290.22	110	694	272	118.77	**119.24**	2.75	0.0	0.0	-	-
BH-03 49.5-51.0	54.0	2290.22	110	693	269	117.46	**117.93**	2.75	0.0	0.0	-	-
BH-03 51.0-52.5	54.0	2290.22	110	695	260	113.53	**113.98**	2.76	0.0	0.0	-	-
BH-03 52.5-54.0	54.0	2290.22	110	696	261	113.96	**114.42**	2.76	0.0	0.0	67145	0.18
BH-03 54.0-55.5	54.0	2290.22	110	694	258	112.65	**113.11**	2.75	0.0	0.0	69520	0.19
BH-03 55.5-57.0	54.0	2290.22	110	695	260	113.53	**113.98**	2.76	0.0	0.0	71053	0.18
BH-05 6.0-7.5	54.0	2290.22	110	666	115	50.21	**50.42**	2.64	0.2	0.4	-	-
BH-05 7.5-9.0	54.0	2290.22	112	680	121	52.83	**53.26**	2.65	0.0	0.0	-	-
BH-05 9.0-10.5	54.0	2290.22	89	541	137	59.82	**57.53**	2.65	0.1	0.5	-	-
BH-05 10.5-12.0	54.0	2290.22	104	631	145	63.31	**62.80**	2.65	0.1	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-05 12.0-13.5	54.0	2290.22	112	689	184	80.34	**80.99**	2.69	0.0	0.4	-	-
BH-05 13.5-15.0	54.0	2290.22	104	659	179	78.16	**77.53**	2.77	0.0	0.4	-	-
BH-05 15.0-16.5	54.0	2290.22	110	692	195	85.14	**85.49**	2.75	0.0	0.2	-	-
BH-05 16.5-18.0	54.0	2290.22	110	699	204	89.07	**89.43**	2.77	0.0	0.1	-	-
BH-05 18.0-19.5	54.0	2290.22	110	701	215	93.88	**94.25**	2.78	0.0	0.1	-	-
BH-05 19.5-21.0	54.0	2290.22	110	701	212	92.57	**92.94**	2.78	0.0	0.0	-	-
BH-05 21.0-22.5	54.0	2290.22	110	704	196	85.58	**85.93**	2.79	0.0	0.0	-	-
BH-05 22.5-24.0	54.0	2290.22	110	701	204	89.07	**89.43**	2.78	0.0	0.0	-	-
BH-05 24.0-25.5	54.0	2290.22	112	705	200	87.33	**88.03**	2.75	0.0	0.0	-	-
BH-05 25.5-27.0	54.0	2290.22	110	706	197	86.02	**86.36**	2.80	0.0	0.0	-	-
BH-05 27.0-28.5	54.0	2290.22	111	708	228	99.55	**100.15**	2.79	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-05 28.5-30.0	54.0	2290.22	110	704	229	99.99	**100.39**	2.79	0.0	0.0	28220	0.19
BH-05 30.0-31.5	54.0	2290.22	110	705	231	100.86	**101.27**	2.80	0.0	0.0	30498	0.23
BH-05 31.5-32.0	54.0	2290.22	110	704	232	101.30	**101.71**	2.79	0.0	0.0	32004	0.21
BH-08 4.5-6.0	54.0	2290.22	110	620	32	13.97	**14.03**	2.46	0.2	0.9	-	-
BH-08 6.0-7.5	54.0	2290.22	110	654	59	25.76	**25.87**	2.60	0.2	0.7	-	-
BH-08 7.5-9.0	54.0	2290.22	111	683	85	37.11	**37.34**	2.68	0.0	0.6	-	-
BH-08 9.0-10.5	54.0	2290.22	110	668	100	43.66	**43.84**	2.65	0.1	0.4	-	-
BH-08 10.5-12.0	54.0	2290.22	108	662	124	54.14	**54.14**	2.68	0.0	0.0	-	-
BH-08 12.0-13.5	54.0	2290.22	112	698	132	57.64	**58.10**	2.72	0.0	0.0	-	-
BH-08 13.5-15.0	54.0	2290.22	98	625	141	61.57	**60.33**	2.78	0.0	0.0	-	-
BH-08 15.0-16.5	54.0	2290.22	108	683	188	82.09	**82.09**	2.76	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-08 16.5-18.0	54.0	2290.22	110	701	210	91.69	**92.06**	2.78	0.0	0.0	-	-
BH-08 18.0-19.5	54.0	2290.22	110	680	235	102.61	**103.02**	2.70	0.0	0.0	-	-
BH-08 19.5-21.0	54.0	2290.22	110	685	244	106.54	**106.97**	2.72	0.0	0.0	-	-
BH-08 21.0-22.5	54.0	2290.22	110	689	245	106.98	**107.41**	2.73	0.0	0.0	-	-
BH-08 22.5-24.0	54.0	2290.22	112	691	250	109.16	**110.04**	2.69	0.0	0.0	-	-
BH-08 24.0-25.5	54.0	2290.22	110	690	248	108.29	**108.72**	2.74	0.0	0.0	-	-
BH-08 25.5-27.0	54.0	2290.22	111	687	231	100.86	**101.47**	2.70	0.0	0.0	-	-
BH-08 27.0-28.5	54.0	2290.22	108	687	145	63.31	**63.31**	2.78	0.0	0.0	-	-
BH-08 28.5-30.0	54.0	2290.22	111	696	230	100.43	**101.03**	2.74	0.0	0.0	-	-
BH-08 30.0-31.5	54.0	2290.22	110	701	232	101.30	**101.71**	2.78	0.0	0.0	-	-
BH-08 31.5-33.0	54.0	2290.22	110	700	229	99.99	**100.39**	2.78	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-08 33.0-34.5	54.0	2290.22	110	698	233	101.74	**102.15**	2.77	0.0	0.0	-	-
BH-08 34.5-36.0	54.0	2290.22	110	701	241	105.23	**105.65**	2.78	0.0	0.0	-	-
BH-08 36.0-37.5	54.0	2290.22	110	695	239	104.36	**104.78**	2.76	0.0	0.0	-	-
BH-08 37.5-39.0	54.0	2290.22	110	696	235	102.61	**103.02**	2.76	0.0	0.0	-	-
BH-08 39.0-40.5	54.0	2290.22	110	700	242	105.67	**106.09**	2.78	0.0	0.0	-	-
BH-08 40.5-42.0	54.0	2290.22	110	701	247	107.85	**108.28**	2.78	0.0	0.0	-	-
BH-08 42.0-43.5	54.0	2290.22	110	699	243	106.10	**106.53**	2.77	0.0	0.0	-	-
BH-08 43.5-45.0	54.0	2290.22	110	700	241	105.23	**105.65**	2.78	0.0	0.0	-	-
BH-08 45.0-46.5	54.0	2290.22	110	700	240	104.79	**105.21**	2.78	0.0	0.0	-	-
BH-08 46.5-48.0	54.0	2290.22	110	701	239	104.36	**104.78**	2.78	0.0	0.0	-	-
BH-08 48.0-49.5	54.0	2290.22	110	700	239	104.36	**104.78**	2.78	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-08 49.5-51.0	54.0	2290.22	110	701	242	105.67	**106.09**	2.78	0.0	0.0	67241	0.17
BH-08 51.0-52.5	54.0	2290.22	110	699	251	109.60	**110.04**	2.77	0.0	0.0	71368	0.18
BH-08 52.5-53.0	54.0	2290.22	110	701	248	108.29	**108.72**	2.78	0.0	0.0	71251	0.16
BH-09 28.5-30.0	54.0	2290.22	70	426	18	7.86	**7.26**	2.66	0.3	1.2	-	-
BH-09 30.0-31.5	54.0	2290.22	97	577	32	13.97	**13.66**	2.60	0.2	0.5	-	-
BH-09 31.5-33.0	54.0	2290.22	98	588	57	24.89	**24.39**	2.62	0.2	0.4	-	-
BH-09 33.0-34.5	54.0	2290.22	105	648	85	37.11	**36.89**	2.69	0.1	0.4	-	-
BH-09 34.5-36.0	54.0	2290.22	110	694	98	42.79	**42.96**	2.75	0.0	0.4	-	-
BH-09 36.0-37.5	54.0	2290.22	110	685	187	81.65	**81.98**	2.72	0.0	0.2	-	-
BH-09 37.5-39.0	54.0	2290.22	110	647	165	72.05	**72.34**	2.57	0.0	0.0	59475	0.21
BH-09 39.5-40.5	54.0	2290.22	110	677	171	74.67	**74.97**	2.69	0.0	0.0	58812	0.23

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-09 40.5-42.0	54.0	2290.22	110	679	180	78.60	**78.91**	2.70	0.0	0.0	63249	0.24
BH-11 4.5-6.0	54.0	2290.22	62	364	15	6.55	**5.94**	2.56	0.4	1.1	-	-
BH-11 6.0-7.5	54.0	2290.22	110	655	69	30.13	**30.25**	2.60	0.1	0.3	-	-
BH-11 7.5-9.0	54.0	2290.22	110	672	74	32.31	**32.44**	2.67	0.0	0.2	-	-
BH-11 9.0-10.5	54.0	2290.22	110	670	81	35.37	**35.51**	2.66	0.0	0.0	-	-
BH-11 10.5-12.0	54.0	2290.22	112	679	86	37.55	**37.85**	2.65	0.0	0.0	-	-
BH-11 12.0-13.5	54.0	2290.22	110	665	94	41.04	**41.21**	2.64	0.0	0.0	-	-
BH-11 13.5-15.0	54.0	2290.22	110	668	99	43.23	**43.40**	2.65	0.0	0.0	-	-
BH-11 15.0-16.5	54.0	2290.22	110	667	105	45.85	**46.03**	2.65	0.0	0.0	-	-
BH-11 16.5-18.0	54.0	2290.22	110	671	98	42.79	**42.96**	2.66	0.0	0.0	-	-
BH-11 18.0-19.5	54.0	2290.22	110	668	100	43.66	**43.84**	2.65	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-11 19.5-21.0	54.0	2290.22	110	659	105	45.85	**46.03**	2.62	0.0	0.0	-	-
BH-11 21.0-22.5	54.0	2290.22	110	659	103	44.97	**45.15**	2.62	0.0	0.0	-	-
BH-11 22.5-24.0	54.0	2290.22	110	661	111	48.47	**48.66**	2.62	0.0	0.0	-	-
BH-11 24.0-25.5	54.0	2290.22	110	664	119	51.96	**52.17**	2.64	0.0	0.0	-	-
BH-11 25.5-27.0	54.0	2290.22	110	668	148	64.62	**64.88**	2.65	0.0	0.0	-	-
BH-11 27.0-28.5	54.0	2290.22	110	667	171	74.67	**74.97**	2.65	0.0	0.0	-	-
BH-11 28.5-30.0	54.0	2290.22	110	664	196	85.58	**85.93**	2.64	0.0	0.0	-	-
BH-11 30.0-31.5	54.0	2290.22	110	670	224	97.81	**98.20**	2.66	0.0	0.0	-	-
BH-11 31.5-33.0	54.0	2290.22	110	672	231	100.86	**101.27**	2.67	0.0	0.0	-	-
BH-11 33.0-34.5	54.0	2290.22	110	669	233	101.74	**102.15**	2.66	0.0	0.0	-	-
BH-11 34.5-36.0	54.0	2290.22	110	674	235	102.61	**103.02**	2.68	0.0	0.0	53221	0.19

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-11 36.0-37.5	54.0	2290.22	110	677	237	103.48	**103.90**	2.69	0.0	0.0	57063	0.17
BH-11 37.5-39.0	54.0	2290.22	110	674	251	109.60	**110.04**	2.68	0.0	0.0	60025	0.17
BH-13 10.5-12.0	54.0	2290.22	102	620	36	15.72	**15.53**	2.65	0.0	0.0	-	-
BH-13 12.0-13.5	54.0	2290.22	104	628	106	46.28	**45.91**	2.64	0.0	0.4	-	-
BH-13 13.5-15.0	54.0	2290.22	109	670	196	85.58	**85.75**	2.68	0.0	0.0	-	-
BH-13 15.0-16.5	54.0	2290.22	109	672	200	87.33	**87.50**	2.69	0.0	0.4	-	-
BH-13 16.5-18.0	54.0	2290.22	103	608	195	85.14	**84.29**	2.58	0.0	0.0	-	-
BH-13 18.0-19.5	54.0	2290.22	110	651	200	87.33	**87.68**	2.58	0.0	0.0	-	-
BH-13 19.5-21.0	54.0	2290.22	112	674	214	93.44	**94.19**	2.63	0.0	0.0	-	-
BH-13 21.0-22.5	54.0	2290.22	110	689	227	99.12	**99.52**	2.73	0.0	0.0	-	-
BH-13 22.5-24.0	54.0	2290.22	104	655	231	100.86	**100.05**	2.75	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-13 24.0-25.5	54.0	2290.22	110	688	230	100.43	**100.83**	2.73	0.0	0.0	-	-
BH-13 25.5-27.0	54.0	2290.22	110	688	243	106.10	**106.53**	2.73	0.0	0.0	-	-
BH-13 27.0-28.5	54.0	2290.22	110	679	250	109.16	**109.60**	2.70	0.0	0.0	68013	0.19
BH-13 28.5-30.0	54.0	2290.22	110	684	248	108.29	**108.72**	2.72	0.0	0.0	79211	0.16
BH-13 30.0-31.5	54.0	2290.22	110	685	253	110.47	**110.91**	2.72	0.0	0.0	-	-
BH-13 31.5-33.0	54.0	2290.22	110	690	249	108.72	**109.16**	2.74	0.0	0.0	-	-
BH-13 33.0-34.5	54.0	2290.22	110	692	261	113.96	**114.42**	2.75	0.0	0.0	-	-
BH-13 34.5-36.0	54.0	2290.22	110	685	258	112.65	**113.11**	2.72	0.0	0.0	-	-
BH-13 36.0-37.5	54.0	2290.22	110	691	243	106.10	**106.53**	2.74	0.0	0.0	-	-
BH-13 37.5-39.0	54.0	2290.22	110	682	249	108.72	**109.16**	2.71	0.0	0.0	-	-
BH-13 39.0-40.5	54.0	2290.22	110	688	261	113.96	**114.42**	2.73	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-13 40.5-42.0	54.0	2290.22	110	685	265	115.71	**116.17**	2.72	0.0	0.0	-	-
BH-13 42.0-43.5	54.0	2290.22	110	684	278	121.39	**121.87**	2.72	0.0	0.0	-	-
BH-13 43.5-45.0	54.0	2290.22	110	682	280	122.26	**122.75**	2.71	0.0	0.0	-	-
BH-13 45.0-46.5	54.0	2290.22	110	689	283	123.57	**124.07**	2.73	0.0	0.0	-	-
BH-13 46.5-48.0	54.0	2290.22	110	690	288	125.75	**126.26**	2.74	0.0	0.0	-	-
BH-13 48.0-49.5	54.0	2290.22	110	684	278	121.39	**121.87**	2.72	0.0	0.0	-	-
BH-13 49.5-51.0	54.0	2290.22	110	682	285	124.44	**124.94**	2.71	0.0	0.0	-	-
BH-13 51.0-52.5	54.0	2290.22	110	680	279	121.82	**122.31**	2.70	0.0	0.0	-	-
BH-13 52.5-54.0	54.0	2290.22	110	685	282	123.13	**123.63**	2.72	0.0	0.0	-	-
BH-13 54.0-55.5	54.0	2290.22	110	692	283	123.57	**124.07**	2.75	0.0	0.0	-	-
BH-13 55.5-57.0	54.0	2290.22	110	690	277	120.95	**121.44**	2.74	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-13 57.0-58.5	54.0	2290.22	110	672	292	127.50	**128.01**	2.67	0.0	0.0	-	-
BH-13 58.5-60.0	54.0	2290.22	110	690	290	126.63	**127.13**	2.74	0.0	0.0	-	-
BH-13 60.0-61.5	54.0	2290.22	110	684	288	125.75	**126.26**	2.72	0.0	0.0	-	-
BH-13 61.5-63.0	54.0	2290.22	110	683	284	124.01	**124.50**	2.71	0.0	0.0	-	-
BH-13 63.0-64.5	54.0	2290.22	110	678	276	120.51	**121.00**	2.69	0.0	0.0	-	-
BH-13 64.5-66.0	54.0	2290.22	110	685	255	111.34	**111.79**	2.72	0.0	0.0	-	-
BH-13 66.0-67.5	54.0	2290.22	110	688	278	121.39	**121.87**	2.73	0.0	0.0	-	-
BH-13 67.5-69.0	54.0	2290.22	110	692	281	122.70	**123.19**	2.75	0.0	0.0	-	-
BH-13 69.0-70.5	54.0	2290.22	110	689	286	124.88	**125.38**	2.73	0.0	0.0	-	-
BH-13 70.5-72.0	54.0	2290.22	110	691	284	124.01	**124.50**	2.74	0.0	0.0	77150	0.19
BH-13 72.0-73.5	54.0	2290.22	110	688	280	122.26	**122.75**	2.73	0.0	0.0	76458	0.19

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-13 73.5-75.0	54.0	2290.22	110	690	294	128.37	**128.89**	2.74	0.0	0.0	80060	0.16
BH-14 19.5-21.0	54.0	2290.22	110	679	58	25.33	**25.43**	2.70	0.0	0.2	-	-
BH-14 21.0-22.5	54.0	2290.22	110	681	78	34.06	**34.19**	2.70	0.0	0.0	-	-
BH-14 22.5-24.0	54.0	2290.22	110	683	95	41.48	**41.65**	2.71	0.0	0.0	-	-
BH-14 24.0-25.5	54.0	2290.22	110	683	101	44.10	**44.28**	2.71	0.0	0.0	-	-
BH-14 25.5-27.0	54.0	2290.22	110	685	99	43.23	**43.40**	2.72	0.0	0.0	-	-
BH-14 27.0-28.5	54.0	2290.22	110	682	111	48.47	**48.66**	2.71	0.0	0.0	-	-
BH-14 28.5-30.0	54.0	2290.22	110	680	126	55.02	**55.24**	2.70	0.0	0.0	-	-
BH-14 30.0-31.5	54.0	2290.22	110	686	132	57.64	**57.87**	2.72	0.0	0.0	-	-
BH-14 31.5-33.0	54.0	2290.22	110	690	138	60.26	**60.50**	2.74	0.0	0.0	-	-
BH-14 33.0-34.5	54.0	2290.22	110	684	152	66.37	**66.64**	2.72	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-14 34.5-36.0	54.0	2290.22	110	682	149	65.06	**65.32**	2.71	0.0	0.0	-	-
BH-14 36.0-37.5	54.0	2290.22	110	684	147	64.19	**64.44**	2.72	0.0	0.0	-	-
BH-14 37.5-39.0	54.0	2290.22	110	685	160	69.86	**70.14**	2.72	0.0	0.0	-	-
BH-14 39.0-40.5	54.0	2290.22	110	686	174	75.98	**76.28**	2.72	0.0	0.0	-	-
BH-14 40.5-42.0	54.0	2290.22	110	679	180	78.60	**78.91**	2.70	0.0	0.0	-	-
BH-14 42.0-43.5	54.0	2290.22	110	679	198	86.45	**86.80**	2.70	0.0	0.0	-	-
BH-14 43.5-45.0	54.0	2290.22	110	685	201	87.76	**88.12**	2.72	0.0	0.0	-	-
BH-14 45.0-46.5	54.0	2290.22	110	682	206	89.95	**90.31**	2.71	0.0	0.0	-	-
BH-14 46.5-48.0	54.0	2290.22	110	686	217	94.75	**95.13**	2.72	0.0	0.0	-	-
BH-14 48.0-49.5	54.0	2290.22	110	685	230	100.43	**100.83**	2.72	0.0	0.0	-	-
BH-14 49.5-51.0	54.0	2290.22	110	687	233	101.74	**102.15**	2.73	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-14 51.0-52.5	54.0	2290.22	110	686	238	103.92	**104.34**	2.72	0.0	0.0	-	-
BH-14 52.5-54.0	54.0	2290.22	110	690	242	105.67	**106.09**	2.74	0.0	0.0	-	-
BH-14 54.0-55.5	54.0	2290.22	110	692	245	106.98	**107.41**	2.75	0.0	0.0	-	-
BH-14 55.5-57.0	54.0	2290.22	110	689	249	108.72	**109.16**	2.73	0.0	0.0	-	-
BH-14 57.0-58.5	54.0	2290.22	110	689	251	109.60	**110.04**	2.73	0.0	0.0	-	-
BH-14 58.5-60.0	54.0	2290.22	110	691	248	108.29	**108.72**	2.74	0.0	0.0	-	-
BH-14 60.0-61.5	54.0	2290.22	110	692	249	108.72	**109.16**	2.75	0.0	0.0	-	-
BH-14 61.5-63.0	54.0	2290.22	110	692	252	110.03	**110.48**	2.75	0.0	0.0	-	-
BH-14 63.0-64.5	54.0	2290.22	110	691	261	113.96	**114.42**	2.74	0.0	0.0	-	-
BH-14 64.5-66.0	54.0	2290.22	110	690	267	116.58	**117.05**	2.74	0.0	0.0	-	-
BH-14 66.0-67.5	54.0	2290.22	110	691	251	109.60	**110.04**	2.74	0.0	0.0	66082	0.20

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-14 67.5-69.0	54.0	2290.22	110	691	253	110.47	**110.91**	2.74	0.0	0.0	70043	0.24
BH-14 69.0-70.0	54.0	2290.22	110	692	265	115.71	**116.17**	2.75	0.0	0.0	73138	0.21
BH-15 6.0-7.5	54.0	2290.22	100	605	14	6.11	**6.01**	2.64	0.2	0.8	-	-
BH-15 7.5-9.0	54.0	2290.22	100	609	29	12.66	**12.46**	2.66	0.1	0.6	-	-
BH-15 9.0-10.5	54.0	2290.22	111	680	46	20.09	**20.21**	2.67	0.1	0.4	-	-
BH-15 10.5-12.0	54.0	2290.22	110	676	67	29.25	**29.37**	2.68	0.1	0.2	-	-
BH-15 12.0-13.5	54.0	2290.22	110	675	72	31.44	**31.56**	2.68	0.0	0.2	-	-
BH-15 13.5-15.0	54.0	2290.22	110	677	75	32.75	**32.88**	2.69	0.0	0.0	-	-
BH-15 15.0-16.5	54.0	2290.22	110	675	80	34.93	**35.07**	2.68	0.0	0.0	-	-
BH-15 16.5-18.0	54.0	2290.22	110	678	92	40.17	**40.33**	2.69	0.0	0.0	-	-
BH-15 18.0-19.5	54.0	2290.22	110	680	96	41.92	**42.09**	2.70	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

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Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-15 19.5-21.0	54.0	2290.22	110	682	169	73.79	**74.09**	2.71	0.0	0.0	-	-
BH-15 21.0-22.5	54.0	2290.22	110	683	185	80.78	**81.10**	2.71	0.0	0.0	-	-
BH-15 22.5-24.0	54.0	2290.22	110	680	196	85.58	**85.93**	2.70	0.0	0.0	-	-
BH-15 24.0-25.5	54.0	2290.22	110	679	211	92.13	**92.50**	2.70	0.0	0.0	-	-
BH-15 25.5-27.0	54.0	2290.22	110	678	224	97.81	**98.20**	2.69	0.0	0.0	-	-
BH-15 27.0-28.5	54.0	2290.22	110	684	231	100.86	**101.27**	2.72	0.0	0.0	-	-
BH-15 28.5-30.0	54.0	2290.22	110	679	232	101.30	**101.71**	2.70	0.0	0.0	-	-
BH-15 30.0-31.5	54.0	2290.22	110	680	241	105.23	**105.65**	2.70	0.0	0.0	-	-
BH-15 31.5-33.0	54.0	2290.22	110	681	239	104.36	**104.78**	2.70	0.0	0.0	-	-
BH-15 33.0-34.5	54.0	2290.22	110	679	240	104.79	**105.21**	2.70	0.0	0.0	-	-
BH-15 34.5-36.0	54.0	2290.22	110	682	235	102.61	**103.02**	2.71	0.0	0.0	-	-

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Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-15 36.0-37.5	54.0	2290.22	110	680	236	103.05	**103.46**	2.70	0.0	0.0	-	-
BH-15 37.5-39.0	54.0	2290.22	110	681	243	106.10	**106.53**	2.70	0.0	0.0	-	-
BH-15 39.0-40.5	54.0	2290.22	110	681	248	108.29	**108.72**	2.70	0.0	0.0	-	-
BH-15 40.5-42.0	54.0	2290.22	110	679	251	109.60	**110.04**	2.70	0.0	0.0	-	-
BH-15 42.0-43.5	54.0	2290.22	110	678	251	109.60	**110.04**	2.69	0.0	0.0	-	-
BH-15 43.5-45.0	54.0	2290.22	110	691	253	110.47	**110.91**	2.74	0.0	0.0	-	-
BH-15 45.0-46.5	54.0	2290.22	110	688	254	110.91	**111.35**	2.73	0.0	0.0	-	-
BH-15 46.5-48.0	54.0	2290.22	110	685	250	109.16	**109.60**	2.72	0.0	0.0	-	-
BH-15 48.0-49.5	54.0	2290.22	110	686	249	108.72	**109.16**	2.72	0.0	0.0	-	-
BH-15 49.5-51.0	54.0	2290.22	110	687	251	109.60	**110.04**	2.73	0.0	0.0	-	-
BH-15 51.0-52.5	54.0	2290.22	110	682	256	111.78	**112.23**	2.71	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-15 52.5-54.0	54.0	2290.22	110	684	247	107.85	**108.28**	2.72	0.0	0.0	-	-
BH-15 54.0-55.5	54.0	2290.22	110	687	251	109.60	**110.04**	2.73	0.0	0.0	-	-
BH-15 55.5-57.0	54.0	2290.22	110	689	257	112.22	**112.67**	2.73	0.0	0.0	73191	0.19
BH-15 57.0-58.5	54.0	2290.22	110	685	261	113.96	**114.42**	2.72	0.0	0.0	75248	0.19
BH-15 58.5-60.0	54.0	2290.22	110	682	263	114.84	**115.30**	2.71	0.0	0.0	73853	0.19
BH-16 19.5-21.0	54.0	2290.22	50	289	13	5.68	**5.01**	2.52	0.0	0.9	-	-
BH-16 21.0-22.5	54.0	2290.22	108	625	15	6.55	**6.55**	2.53	0.0	0.8	-	-
BH-16 22.5-24.0	54.0	2290.22	108	627	16	6.99	**6.99**	2.53	0.2	1.2	-	-
BH-16 24.0-25.5	54.0	2290.22	67	393	19	8.30	**7.61**	2.56	0.3	2.2	-	-
BH-16 25.5-27.0	54.0	2290.22	105	638	81	35.37	**35.15**	2.65	0.1	0.8	-	-
BH-16 27.0-28.5	54.0	2290.22	103	621	83	36.24	**35.88**	2.63	0.0	0.6	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	28.02.2025		
		Date of Testing	01.03.2025 to 25.03.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-16 28.5-30.0	54.0	2290.22	106	641	88	38.42	**38.27**	2.64	0.2	1.2	-	-
BH-16 30.0-31.5	54.0	2290.22	110	670	90	39.30	**39.46**	2.66	0.0	0.4	-	-
BH-16 31.5-33.0	54.0	2290.22	110	672	99	43.23	**43.40**	2.67	0.0	0.2	28512	0.23
BH-16 33.0-34.5	54.0	2290.22	110	678	120	52.40	**52.61**	2.69	0.0	0.0	30005	0.19
BH-16 34.5-36.0	54.0	2290.22	110	681	124	54.14	**54.36**	2.70	0.0	0.0	31479	0.20

NOTE :

* Sample extracted from Site location.

This Test Report related to the sample submitted for testing only.

This Test Report shall not be reproduced, except in full, without the approval of the laboratory.

Any correction/whitner invalidates this Tests Report.

Mohammed Habeeb, Quality Manager

Authorised Signatory

APPENDIX-C

Detailed Calculations of Rock Mass Rating (RMR)
IS : 12070-1987

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Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	28.02.2025		

Rock Mass Rating as per IS : 12070-1987

BH-03			**Rock Mass Rating Parameters**														
Depth		**Run (m)**	**UCS**		**RQD**		**Spacing of Discontinuties**		**Condition of Discontinuties**		**Ground Water Condition**		**Joint Orientation**		**RMR Classification**		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
9.0	10.5	1.5	19.73	2	22	3	<60mm	5	Slickered Surface	10	Damp	10	Un Favourable	-10	20	V	Very Poor
12.0	13.5	1.5	31.56	4	21	3	<60mm	5	Slickered Surface	10	Damp	10	Un Favourable	-10	22	IV	Poor
15.0	16.5	1.5	27.35	4	12	3	<60mm	5	Slickered Surface	10	Wet	7	Un Favourable	-10	19	V	Very Poor
21.0	22.5	1.5	62.69	7	49	8	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	45	III	Fair
25.5	27.0	1.5	77.18	7	60	13	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	52	III	Fair
31.5	33.0	1.5	98.64	7	90	17	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	56	III	Fair
39.0	40.5	1.5	108.72	12	100	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	64	II	Good
45.0	46.5	1.5	115.74	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Favourable	-2	77	II	Good
52.5	54.0	1.5	114.42	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Favourable	-2	77	II	Good
55.5	57.0	1.5	113.98	12	100	20	>2m	20	Slightly Rough	25	Wet	7	Favourable	-2	82	I	Very Good

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	28.02.2025		

BH-05			**Rock Mass Rating Parameters**														
Depth		**Run (m)**	**UCS**		**RQD**		**Spacing of Discontinuties**		**Condition of Discontinuties**		**Ground Water Condition**		**Joint Orientation**		**RMR Classification**		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
6.0	7.5	1.5	50.42	7	47	8	<60mm	5	Slightly Rough	10	Damp	10	Un Favourable	-7	33	IV	Poor
9.0	10.5	1.5	57.53	7	0	3	<60mm	5	Slickered Surface	10	Wet	7	Un Favourable	-7	25	IV	Poor
12.0	13.5	1.5	80.99	7	45	8	<60mm	5	Slightly Rough	20	Wet	7	Fair	-5	42	III	Fair
16.5	18.0	1.5	89.43	7	48	8	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	45	III	Fair
19.5	21.0	1.5	92.94	7	43	8	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	45	III	Fair
22.5	24.0	1.5	89.43	7	78	17	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	56	III	Fair
27.0	28.5	1.5	102.79	12	88	17	200-600mm	10	Slightly Rough	20	Wet	7	Favourable	-2	64	II	Good
28.5	30.0	1.5	108.28	12	87	17	200-600mm	10	Slightly Rough	20	Wet	7	Favourable	-2	64	II	Good
30.0	31.5	1.5	109.16	12	90	17	0.6-2m	15	Slightly Rough	25	Wet	7	Favourable	-2	74	II	Good
31.5	32.0	0.5	107.85	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Favourable	-2	77	II	Good

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Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	28.02.2025		

BH-08			**Rock Mass Rating Parameters**														
Depth		**Run (m)**	**UCS**		**RQD**		**Spacing of Discontinuties**		**Condition of Discontinuties**		**Ground Water Condition**		**Joint Orientation**		**RMR Classification**		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
4.5	6.0	1.5	14.03	2	9	3	<60mm	5	Slickered Surface	10	Wet	7	Un Favourable	-7	20	V	Very Poor
6.0	7.5	1.5	25.87	4	46	8	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	44	III	Fair
9.0	10.5	1.5	43.84	4	58	13	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	49	III	Fair
13.5	15.0	1.5	60.33	7	73	13	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	57	III	Fair
16.5	18.0	1.5	92.06	7	89	17	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	61	II	Good
21.0	22.5	1.5	107.41	12	91	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
24.0	25.5	1.5	108.72	12	97	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
30.0	31.5	1.5	112.67	12	94	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
33.0	34.5	1.5	110.48	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
37.5	39.0	1.5	114.92	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good

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Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	28.02.2025		

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
42.0	43.5	1.5	120.12	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
46.5	48.0	1.5	114.86	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
49.5	51.0	1.5	120.12	12	100	20	>2m	20	Slightly Rough	25	Wet	7	Favourable	-2	82	I	Very Good
52.5	53.0	0.5	119.68	12	100	20	>2m	20	Slightly Rough	25	Wet	7	Favourable	-2	82	I	Very Good

BH-09 — **Rock Mass Rating Parameters**

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
28.5	30.0	1.5	7.26	2	0	3	<60mm	5	Slickered Surface	10	Wet	7	Un Favourable	-10	17	V	Very Poor
30.0	31.5	1.5	13.66	2	29	8	<60mm	5	Slightly Rough	20	Wet	7	Un Favourable	-10	32	IV	Poor
31.5	33.0	1.5	24.39	2	11	3	<60mm	5	Slightly Rough	20	Wet	7	Un Favourable	-10	27	IV	Poor
33.0	34.5	1.5	36.89	4	78	17	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	51	III	Fair

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	28.02.2025		

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
34.5	36.0	1.5	42.96	4	82	17	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	51	III	Fair
36.0	37.5	1.5	81.98	7	99	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	59	III	Fair
37.5	39.0	1.5	72.34	7	97	20	0.6-2m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
39.0	40.5	1.5	74.97	7	97	20	0.6-2m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
40.5	42.0	1.5	78.91	7	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good

BH-11 — **Rock Mass Rating Parameters**

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
4.5	6.0	1.5	5.94	2	9	3	<60mm	5	Slickered Surface	10	Damp	10	Un Favourable	-10	20	V	Very Poor
7.5	9.0	1.5	32.44	4	30	8	60-200mm	8	Slickered Surface	10	Wet	7	Fair	-5	32	IV	Poor
13.5	15.0	1.5	43.4	4	40	8	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	42	III	Fair
18.0	19.5	1.5	43.84	4	80	17	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	51	III	Fair

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Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	28.02.2025		

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
22.5	24.0	1.5	48.66	4	82	17	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	53	III	Fair
25.5	27.0	1.5	64.88	7	94	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	59	III	Fair
27.0	28.5	1.5	74.97	7	95	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	59	III	Fair
28.5	30.0	1.5	85.93	7	99	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	59	III	Fair
30.0	31.5	1.5	98.2	7	99	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	64	II	Good
31.5	33.0	1.5	101.71	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good
33.0	34.5	1.5	104.78	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good
34.5	36.0	1.5	111.35	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Favourable	-2	77	II	Good
36.0	37.5	1.5	114.42	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Favourable	-2	77	II	Good
37.5	39.0	1.5	117.49	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Favourable	-2	77	II	Good

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Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	28.02.2025		

BH-13			**Rock Mass Rating Parameters**														
Depth		**Run (m)**	**UCS**		**RQD**		**Spacing of Discontinuties**		**Condition of Discontinuties**		**Ground Water Condition**		**Joint Orientation**		**RMR Classification**		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
12.0	13.5	1.5	15.53	2	50	8	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	40	IV	Poor
15.0	16.5	1.5	87.5	7	73	13	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	50	III	Fair
19.5	21.0	1.5	94.19	7	75	13	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	50	III	Fair
24.0	25.5	1.5	100.83	12	98	20	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	62	II	Good
27.0	28.5	1.5	109.6	12	100	20	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	62	II	Good
30.0	31.5	1.5	110.91	12	100	20	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	62	II	Good
36.0	37.5	1.5	106.53	12	100	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	64	II	Good
40.5	42.0	1.5	116.17	12	100	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	64	II	Good
45.0	46.5	1.5	124.07	12	100	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	64	II	Good
48.0	49.5	1.5	121.87	12	100	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	64	II	Good
54.0	55.5	1.5	124.07	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
58.5	60.0	1.5	131.96	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
60.0	61.5	1.5	131.08	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
63.0	64.5	1.5	136.78	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good

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Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	28.02.2025		

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
66.0	67.5	1.5	137.66	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
69.0	70.5	1.5	140.29	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good
70.5	72.0	1.5	139.85	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good
72.0	73.5	1.5	138.53	12	100	20	>2m	20	Slightly Rough	25	Wet	7	Favourable	-2	82	I	Very Good
73.5	75.0	1.5	142.48	12	100	20	>2m	20	Slightly Rough	25	Wet	7	Favourable	-2	82	I	Very Good

BH-14 — **Rock Mass Rating Parameters**

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
19.5	21.0	1.5	25.43	4	87	17	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	53	III	Fair
22.5	24.0	1.5	41.65	4	98	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	56	III	Fair
27.0	28.5	1.5	48.66	4	91	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	56	III	Fair
30.0	31.5	1.5	57.87	7	96	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	59	III	Fair
33.0	34.5	1.5	66.64	7	100	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	59	III	Fair
37.5	39.0	1.5	70.14	7	100	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	59	III	Fair

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Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	28.02.2025		

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
42.0	43.5	1.5	86.8	7	100	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	59	III	Fair
45.0	46.5	1.5	90.31	7	100	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	59	III	Fair
48.0	49.5	1.5	100.83	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
51.0	52.5	1.5	104.34	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
54.0	55.5	1.5	109.6	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
57.0	58.5	1.5	109.16	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
58.5	60.0	1.5	113.11	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good
60.0	61.5	1.5	115.3	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good
63.0	64.5	1.5	113.98	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good
66.0	67.5	1.5	119.24	12	100	20	>2m	20	Slightly Rough	25	Wet	7	Favourable	-2	82	I	Very Good
67.5	69.0	1.5	122.75	12	100	20	>2m	20	Slightly Rough	25	Wet	7	Favourable	-2	82	I	Very Good
69.0	70.0	1.0	124.5	12	100	20	>2m	20	Slightly Rough	25	Wet	7	Favourable	-2	82	I	Very Good

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	10.03.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	28.02.2025		

BH-15			**Rock Mass Rating Parameters**														
Depth		**Run (m)**	**UCS**		**RQD**		**Spacing of Discontinuties**		**Condition of Discontinuties**		**Ground Water Condition**		**Joint Orientation**		**RMR Classification**		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
6.0	7.5	1.5	6.01	2	17	3	<60mm	5	Slickered Surface	0	Wet	7	Un Favourable	-10	7	V	Very Poor
10.5	12.0	1.5	29.37	4	0	3	60-200mm	8	Slickered Surface	10	Wet	7	Un Favourable	-10	22	IV	Poor
12.0	13.5	1.5	31.56	4	19	3	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	37	IV	Poor
15.0	16.5	1.5	35.07	4	84	17	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	53	III	Fair
19.5	21.0	1.5	74.09	7	80	17	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	56	III	Fair
24.0	25.5	1.5	92.5	7	82	17	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	56	III	Fair
27.0	28.5	1.5	101.37	12	83	17	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	61	II	Good
28.5	30.0	1.5	101.71	12	93	20	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	64	II	Good
30.0	31.5	1.5	105.65	12	98	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
33.0	34.5	1.5	105.21	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
37.5	39.0	1.5	106.53	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
42.0	43.5	1.5	110.91	12	100	20	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	69	II	Good
48.0	49.5	1.5	111.35	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
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Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	28.02.2025		

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
51.0	52.5	1.5	121.87	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good
52.5	54.0	1.5	121.44	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good
55.5	57.0	1.5	123.19	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good
57.0	58.5	1.5	123.19	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good
58.5	60.0	1.5	127.57	12	100	20	0.6-2m	15	Slightly Rough	25	Wet	7	Fair	-5	74	II	Good

BH-16		Rock Mass Rating Parameters															
Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
19.5	21.0	1.5	5.01	2	21	3	<60mm	5	Slickered Surface	10	Wet	7	Un Favourable	-10	17	V	Very Poor
21.0	22.5	1.5	6.55	2	34	8	<60mm	5	Slickered Surface	10	Wet	7	Fair	-5	27	IV	Poor
22.5	24.0	1.5	6.99	2	35	8	<60mm	5	Slickered Surface	10	Wet	7	Fair	-5	27	IV	Poor

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Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	28.02.2025		

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
24.0	25.5	1.5	7.61	2	21	8	<60mm	5	Slightly Rough	20	Wet	7	Fair	-5	37	IV	Poor
25.5	27.0	1.5	35.15	4	22	8	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	42	III	Fair
27.0	28.5	1.5	35.88	4	27	8	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	42	III	Fair
28.5	30.0	1.5	38.27	4	41	8	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	44	III	Fair
30.0	31.5	1.5	39.46	4	52	13	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	49	III	Fair
31.5	33.0	1.5	43.4	4	62	13	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	49	III	Fair
33.0	34.5	1.5	52.61	7	64	13	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	52	III	Fair
34.5	36.0	1.5	54.36	7	78	17	0.6-2m	15	Slightly Rough	20	Wet	7	Fair	-5	61	II	Good

NOTE :

* Sample extracted from Site location.

This Test Report related to the sample submitted for testing only.

This Test Report shall not be reproduced, except in full, without the approval of the laboratory.

Any correction/whitner invalidates this Tests Report.

Mohammed Habeeb, Quality Manager

Authorised Signatory

APPENDIX-D

SOIL/ROCK PROFILE

CIVIL LAB AND GEOTECH CONSULTANTS

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APPENDIX-D

PROFILE OF SOIL AND ROCK STRATUM WITH RESPECT TO EXISTING GROUND LEVEL

Depth (m)	BH-03		BH-05		BH-08		BH-09		BH-11	
0.00		values		N values		N values		N values		N values
1.50		16		11		23		17		7
3.00		20		39		32		33		R
4.50		R		R		R		34		R
6.00		R		R		-		36		-
7.50		R		-		-		42		-
9.00		-		-		-		44		-
10.50		-		-		-		50		-
12.00		-		-		-		R		-
13.50		-		-		-		R		-
15.00		-		-		-		54		-
16.50		-		-		-		R		-
18.00		-		-		-		R		-
19.50		-		-		-		R		-
21.00		-		-		-		R		-
22.50		-		-		-		R		-
24.00		-		-		-		R		-
25.50		-		-		-		R		-
27.00		-		-		-		R		-
28.50		-		-		-		R		-
30.00		-		-		-		-		-
31.50		-		-		-		-		-
33.00		-		-		-		-		-
34.50		-				-		-		-
36.00		-				-		-		-
37.50		-				-		-		-
39.00		-				-		-		-
40.50		-				-		-		
42.00		-				-		-		
43.50		-				-				
45.00		-				-				
46.50		-				-				
48.00		-				-				
49.50		-				-				
51.00		-				-				
52.50		-				-				
54.00		-				-				
55.50		-								
57.00		-								

Granular Soil Soft Rock Weathered Rock

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APPENDIX-D

PROFILE OF SOIL AND ROCK STRATUM WITH RESPECT TO EXISTING GROUND LEVEL

Depth (m)	BH-13 N values	BH-14 N values	BH-15 N values	BH-16 N values	BH-17 N values
0.00					
1.50	16	21	10	28	20
3.00	29	28	20	40	34
4.50	14	27	R	R	39
6.00	R	38	R	35	34
7.50	R	20	-	42	42
9.00	R	28	-	62	39
10.50	R	30	-	R	43
12.00	-	34	-	52	27
13.50	-	R	-	R	33
15.00	-	R	-	41	R
16.50	-	R	-	50	50
18.00	-	R	-	R	R
19.50	-	-	-	R	R
21.00	-	-	-	-	R
22.50	-	-	-	-	R
24.00	-	-	-	-	R
25.50	-	-	-	-	R
27.00	-	-	-	-	R
28.50	-	-	-	-	R
30.00	-	-	-	-	R
31.50	-	-	-	-	
33.00	-	-	-	-	
34.50	-	-	-	-	
36.00	-	-	-	-	
37.50	-	-	-		
39.00	-	-	-		
40.50	-	-	-		
42.00	-	-	-		
43.50	-	-	-		
45.00	-	-	-		
46.50	-	-	-		
48.00	-	-	-		
49.50	-	-	-		
51.00	-	-	-		
52.50	-	-	-		
54.00	-	-	-		
55.50	-	-	-		
57.00	-	-	-		
58.50	-	-	-		
60.00	-	-			
61.50	-	-			
63.00	-	-			
64.50	-	-			
66.00	-	-			
67.50	-	-			
69.00	-	-			
70.50	-	-			
72.00	-				
73.50	-				
75.00	-				

Granular Soil   **Soft Rock**   **Weathered Rock**

FIG-1

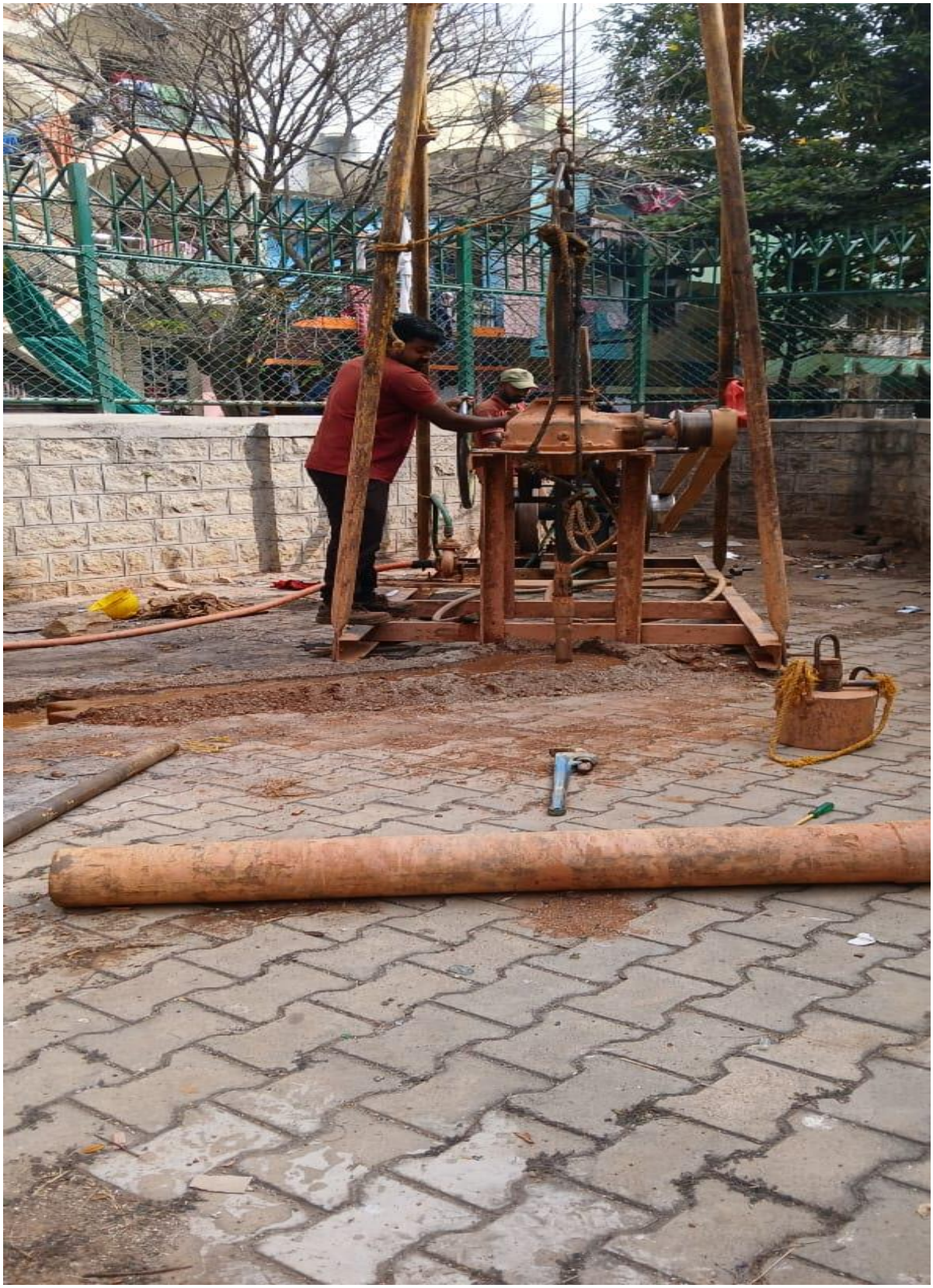
PHOTOS OF GEOTECHNICAL INVESTIGATION FOR CONSULTANCY SERVICES FOR PREPARATION OF DPR FOR THE WORK OF CONSTRUCTION OF UNDER GROUND VEHICULAR TUNNEL FROM HEBBAL ESTEEM MALL JUNCTION TO SILK BOARD KSRP JUNCTION

BH-03, Golf Course, Bengaluru.

BH-05, Freedom Park

BH-08, Silver Jubilee Park, K R Market, Bengaluru.

BH-09, Lal Bagh, Bengaluru



BH-11, Pwd Quarters, Siddapura, Bengaluru

BH-13, NIMHANS, Bengaluru

BH-14, Govt ITI College, Dairy Circle, Hosur Road, Bengaluru.

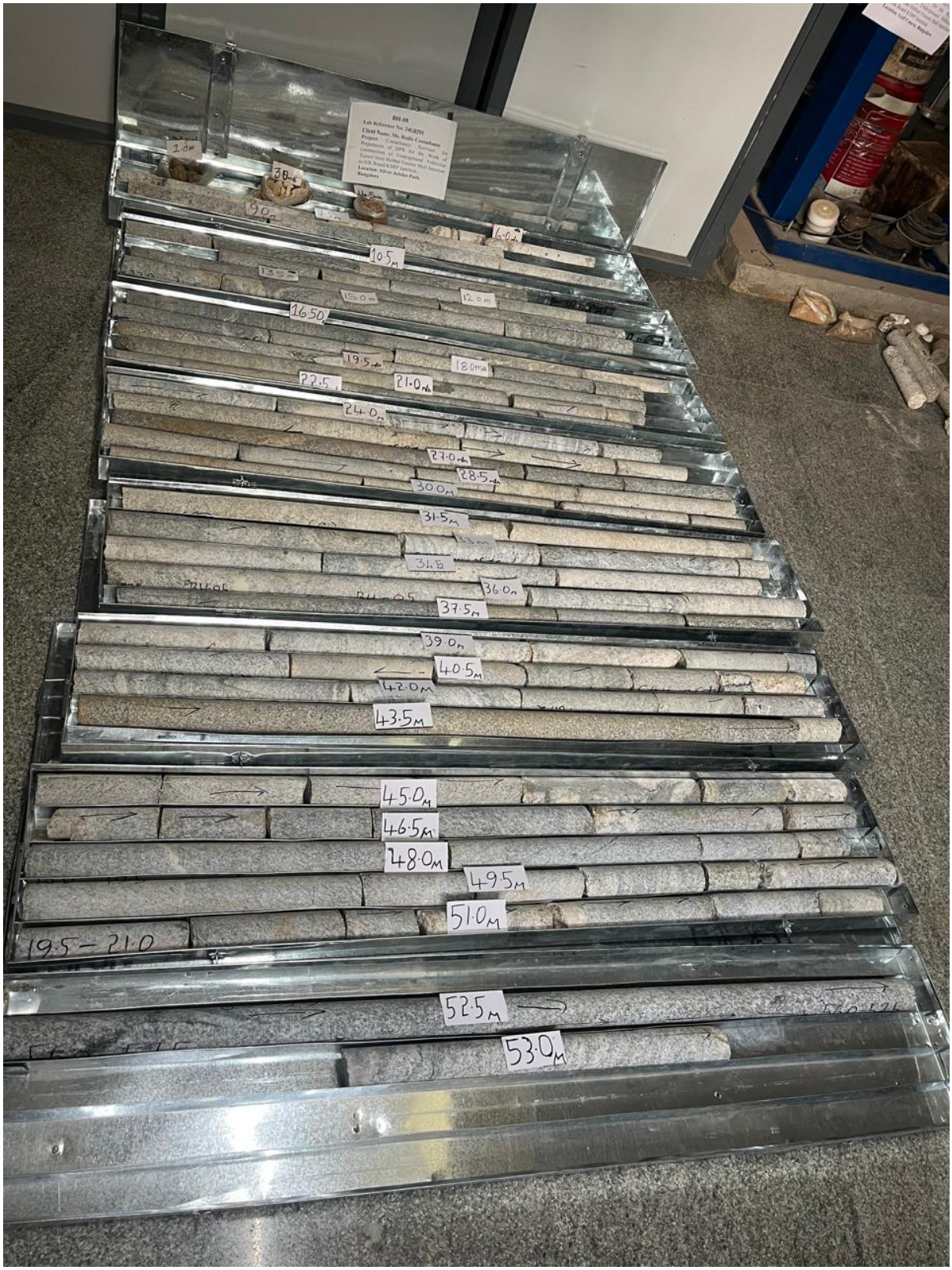
BH-15, Christ University, Hosur Road, Bengaluru.

BH-16, St Johns Staff Quarters, Bengaluru

BH-17, St Johns Staff Quarters, Bengaluru

BH-03, Golf Course, Bengaluru.

BH-05, Freedom Park



BH-08, Silver Jubilee Park, K R Market, Bengaluru.

BH-09, Lal Bagh, Bengaluru

BH-11, Pwd Quarters, Siddapura, Bengaluru

BH-13, NIMHANS, Bengaluru

BH-14, Govt ITI College, Dairy Circle, Hosur Road, Bengaluru.

BH-15, Christ University, Hosur Road, Bengaluru.

BH-16, St Johns Staff Quarters, Bengaluru.

BH-17, St Johns Staff Quarters, Bengaluru.

Part-B

REPORT OF

GEOTECHNICAL ENGINEERING

INVESTIGATION FOR

CONSULTANCY SERVICES FOR PREPARATION OF DPR FOR THE WORK OF CONSTRUCTION OF UNDER GROUND VEHICULAR TUNNEL FROM HEBBAL ESTEEM MALL JUNCTION TO SILK BOARD KSRP JUNCTION

FOR

M/S. RODIC CONSULTANTS PVT LTD

APRIL-2025

Prepared By:

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

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Date: April 09, 2025

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Subject: **REPORT ON GEOTECHNICAL INVESTIGATION FOR CONSULTANCY SERVICES FOR PREPARATION OF DPR FOR THE WORK OF CONSTRUCTION OF UNDER GROUND VEHICULAR TUNNEL FROM HEBBAL ESTEEM MALL JUNCTION TO SILK BOARD KSRP JUNCTION**

Dear Sir,

Submitted herewith is our geotechnical investigation report for the above referenced subject. This study was performed according to your acceptance of our offer dated 10th January 2025. Total eight (08) no. of Exploratory borings drilled up to maximum depth of 24.0m to 62.0m or up to rock strata at the site are drilled to evaluate the subsurface conditions.

This report contains the results of our findings, an engineering interpretation of these with respect to the available project characteristics and recommendations to aid Preparation of DPR for the work of construction of under-ground vehicular tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

We appreciate the opportunity to be of service to you on this project. If we can be of any further assistance, or if you have any concern regarding this report, please contact our office.

Best Regards,
For Civil Lab and Geotech Consultants

Mohammed Habeeb
Authorized Signatory
Geotechnical Consultants

Project: Proposed Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction
Location: Hebbal Esteem Mall Junction to Silk Board KSRP Junction
Client: M/s. Rodic Consultants Pvt Ltd

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 Description of proposed Project Characteristics 1

2.0 PURPOSE AND SCOPE OF GEOTECHNICAL INVESTIGATION 1

2.1 Purpose of Geotechnical Investigation: 1
2.2. Scope of the Geotechnical Investigation 2
2.2.1. Field Investigations 2
2.2.2. Laboratory Testing 2
2.3. Preparation of factual Geotechnical Report 3

3.0 FIELD INVESTIGATION 3

3.1 Summary of operations 3
3.2 Description of sampling procedures 3
3.2.1 Disturbed soil Samples: 3
3.2.2 Undisturbed soil Samples: 4
3.3 Description of field test 4
3.3.1 Standard Penetration Test 4
3.4 Logs of Borings 5
3.5 Details of Boreholes location and Profile 5

4.0 LABORATORY TESTING PROGRAM 6

4.1 Lab Tests on SOIL: 6
4.2 Lab Tests on ROCK: 7

5.0 SITE & SUBSURFACE CONDITIONS 8

5.1 Site surface description 8
5.2 Subsurface material properties 8
5.3 Ground water level measurement 8

6.0 ROCK MASS CLASSIFICATION 9

6.1 Rock Mass Rating (RMR) System 9

7.0 CONCLUSION 12

8.0 LIMITATIONS OF STUDY 15

9. 0 REFERENCES 16

APPENDIX A - BORELOG DETAILS
APPENDIX A-1- GEOLOGICAL BORELOG DETAILS
APPENDIX B - LAB TEST RESULTS OF SOIL SAMPLES
APPENDIX C – DETAILED CALCULATIONS OF RMR
APPENDIX D - SOIL & ROCK PROFILE
FIG-1 - SITE WORKS AND SAMPLES PHOTOGRAPHS

1.0 INTRODUCTION

1.1 Description of proposed Project Characteristics

M/s. Rodic Consultants Pvt Ltd is preparing plans for the Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

Civil Lab and Geotech Consultants is contracted by **M/s. Rodic Consultants Pvt Ltd** to perform the geotechnical investigation at the proposed site, by executing eight (08) no. of Exploratory borings up to maximum depth of 24.0m to 62.0m or up to rock strata at the site.

Based on the information provided, the proposed project includes the Preparation of DPR for the proposed project.

2.0 PURPOSE AND SCOPE OF GEOTECHNICAL INVESTIGATION

2.1 Purpose of Geotechnical Investigation:

The purpose of this Geotechnical investigation study is to determine the general subsurface conditions by drilling eight (08) exploratory borings up to sufficient depth of 24.0m to 62.0m or up to rock strata to accommodate the proposed project.

The Purpose of Geo-Technical Investigation is to evaluate the following:

- Geotechnical investigation by Drilling boreholes.
- To ascertain the sub-soil strata for the proposed construction of this project
- To study standing Ground Water Level
- To study the physical and engineering properties of soil and rock strata
- Laboratory testing of rock and soil samples.
- Submission of detailed geotechnical report.

2.2. Scope of the Geotechnical Investigation

The Scope of Geo-technical Investigations includes the following In-situ and Laboratory Tests.

2.2.1. Field Investigations

i) Mobilization of all necessary Equipment for drilling the boreholes to the required depth in both rock and soil stratum.

ii) Drilling 08 No. boreholes 100 mm dia in soils and Nx size in rock using Calyx Operated Rotary Drilling Rig up to the sufficient depth 24.0m to 62.0m or up to the hard rock as per the Engineers instruction.

iii) Collecting Undisturbed Soil / Sand Samples as per IS: 8763 – 1978.

iv) Conducting Standard Penetration Test SPT as per IS 2131 – 1981 at every 1.5m depth or at every change of strata

v) Collecting disturbed and representative soil samples at Ground level in the Bore holes as per IS: 1892-1979.

vi) Collection of Rock Core Samples in weathered and fresh Bed Rock as per IS 4464:1985

vii) Observe the water table level in the area (through borehole)

2.2.2. Laboratory Testing

The design parameters can be obtained based on the following general laboratory Tests.

i) Grain Size Analysis as per IS: 2720 (Part 4) – 1985.

ii) Specific Gravity as per IS: 2720- (Part 3 / Section 1&2) - 1980.

iii) Atterberg Limits as per IS: 2720 (Part 5) – 1985.

iv) Determination of natural moisture content as per IS 2720 (Part 2) - 1978.

v) Determination Differential Free Swelling Index as per IS: 2720 (Part 40) – 1977

vi) Determination of Shear strength parameters By Direct Shear Tests as per IS: 2720 (part-13): 1986.

vii) Determination of Unconfined Compressive Strength of Rock Core Samples as per IS: 9143:1985.

viii) Determination of Unit Weight, Specific Gravity and Water Absorption of Rock Core Samples as per IS: 13030:1991, IS: 1124:1974

ix) Determination of Modulus of Elasticity and Poisson's Ratio of Rock in Uniaxial Compression (IS 9221)

2.3. Preparation of factual Geotechnical Report

This comprises preparing a brief soil report including soil/rock profiles, correlated physical and engineering properties of soil/rock samples based on visual soil / strata, visual classification and type of soil / rocky strata, recommendations regarding various properties of soil and rock and submission of detailed geotechnical investigation report with complete relevant data.

3.0 FIELD INVESTIGATION

The field investigation was carried out to determine the engineering characteristics of the Sub-Surface materials included a reconnaissance of the project site, drilling of exploratory borings and recovering representative soil/rock samples.

3.1 Summary of operations

The general subsurface conditions were investigated as per IS 1892:1979 (reaffirmed 2021) by drilling eight (08) exploratory borings drilled to a depth of 24.0m to 62.0m where soft rock/very strong rock strata encountered. The borehole locations were determined and established in the field by the client.

The drilling work was conducted by means of rotary drilling techniques with bentonite-water flush using Calyx rotary drilling rig.

The depths of boreholes together with the descriptions, depths of strata encountered, water table and levels at which samples were recovered are indicated in the accompanying boring log sheets (Appendix-A), along with this a Geological boring log is also attached (Appendix-A-1)

3.2 Description of sampling procedures

3.2.1 Disturbed soil Samples:

These are the samples in which the natural structure of the soil gets disturbed during sampling. However, these samples truly represent the composition and the mineral content of soil. The disturbed soil can be used to determine the index properties of soil, such as grain size, plasticity characteristics and specific gravity. Split spoon samplers are used to collect these samples. In this investigation the disturbed samples were collected during SPT test for soil classification and identification.

3.2.2 Undisturbed soil Samples:

These are the samples in which the natural structure of the soil and the water content are retained. Undisturbed samples are used for determining the engineering properties of soil, such as compressibility and shear strength. Usually, undisturbed samples of cohesive soils were collected. Shelby tubes were used to collect the undisturbed sample of cohesive soil if it encountered.

3.2.3 Sampling in Rocky stratum:

Once the hard stratum or rock surface is met the size of the borehole is reduced to NX size (76mm). The hard stratum or top of the rock surface is conformed, either by the refusal from standard penetration test N value or due to resistance during the drilling operation. In this hard stratum using NX core drilling with TC/Diamond studded bits carries out further work. The maximum length of the drill (run) maintained is 1.50m. At the end of each run the drill rod string with core barrel is extracted from the borehole and core is recovered from the core barrel. The core samples were extracted from the core barrels in a manner to prevent disturbances to the core. The cores are carefully transferred to the core boxes and preserved. The core recovery percentage is recorded and also the core pieces transferred to the core box are numbered and labelled properly. Rock Quality Designation (RQD) is also recorded. The selected core samples are sent to the laboratory for conducting physical tests.

3.3 Description of field test

The proposed project has the following field test and they described as follows:

3.3.1 Standard Penetration Test

During drilling, Standard Penetration Test (SPT) was carried out as per IS 2131: 1981 at regular depth intervals of 1.5m in order to assess the N value and relative densities of the existing soils. In this test, the number of blows required to drive a split spoon sampler with a weight 63.5 kg free falling from a height of 750mm for a total penetration distance of 450 mm in increments of 150 mm is recorded. The number of blows required to drive the split spoon sampler for the first 150mm is referred to as seating blow count and does not enter into the calculation of 'N' value. The 'N' value is the number of blows required to drive the split spoon sampler for the next 300mm (i.e., from 150 mm to 450 mm). The depths at which the Standard Penetration Tests were carried out and resulting 'N' values are given on the accompanying boring log sheets Appendix-A.

3.4 Logs of Borings

Eight (08) boreholes were drilled on the marked location. The details of complete description, thickness of all strata, locations referenced to coordinates, ground water elevation and SPT values are all mentioned in the prepared bore log, which are presented in **Appendix A.**

3.5 Details of Boreholes location and Profile

The following are details of borehole locations, respective structure, soil and rock profile and total depth of drilling.

Bore Hole No	Chainages	Co ordinates		Structure Name/ Location	Layer thickness of sub-soil stratification			Total Depth (m)
		Easting	Northing		Soil strata	Refusal strata	Rock with core recovery	
BH-01	1+330	77.5963 115	13.04219	Under Ground Vehicular Tunnel Road	3.0-14.0	14.0-22.5	0.0-3.0 22.5-43.0	43.0
BH-02	1+340	'77° 35' 30" E	'13° 02' 33" N		0.0-18.5	18.5-24.0	24.0-35.0	35.0
BH-04	8+800	780039. 119	1436422.8 75		0.0-3.5	3.5-4.5	4.5-43.0	43.0
BH-06	9+350	780019. 095	1435873.3 11		0.0-2.0	2.0-3.0	3.0-62.0	62.0
BH-07	0+210	780421. 946	1435233.7 35		0.0-17.0	17.0-24.0	-	24.0
BH-10	12+700	780923. 86	1432660.9 16		-	-	0.0-42.0	42.0
BH-12	1+350	'77° 35' 52" E	'13° 02' 33" N		0.0-12.5	12.5-34.5	34.5-35.0	35.0
BH-18	2+250	'77° 35'32.1 " E	'13° 01' 59.8" N		-	-	0.0-40.0	40.0

4.0 LABORATORY TESTING PROGRAM

In addition to the field investigation, a supplemental laboratory-testing program was conducted to determine additional pertinent engineering characteristics of the foundation materials necessary for analyzing the behavior of the proposed structure.

The laboratory testing program included relevant index and Engineering properties
The results of these selected samples obtained from all the test boring from ground level to terminated depths were analyzed and included in the **Appendix B.**

4.1 Lab Tests on SOIL:

- Moisture Content: Natural moisture content (NMC) of the soil samples was determined from the collected disturbed & undisturbed samples using Oven Drying Method, as per IS 2720-1173 (Part II) (Reaffirmed-2020).

- Atterberg Limit Test: The Atterberg Limits comprising liquid limit, plastic limit and plasticity index were determined on soil samples in accordance with the relevant methods described in IS:2720-1985 (PART-V) (Reaffirmed-2020). The liquid limit has been determined using the Casagrande apparatus method. In accordance with the Standard, soil sample preparation included removal of soil particles retained on the 425μm sieve. Accordingly, where significant quantities of coarser particles are present, it should be recognized that the Atterberg Limits results are representative of the relatively fine soil fraction, and not of the complete soil sample.

- Grain Size Distribution Analysis: Grain size distribution analysis by sieve analysis was conducted on selected samples to determine the Grain Size Distribution. The Sieve Analysis was carried out on soil samples in accordance with IS: 2720-1985 (PART-IV) (Reaffirmed-2020) by wet sieving method. Particularly in SPT samples the quantity of soil sample available for testing is typically 100 gm. This sample quantity is considered representative of soil where grain size ranges up to 4.75 mm (Coarser sand size).

- Sedimentation analysis was performed on soil samples in accordance with the hydrometer method described in IS: 2720-1985 (PART-IV) (Reaffirmed-2020). The analysis provides an estimate of the particle size distribution for the fine fraction (<75micron) of soil sample.
  The analysis was performed by monitoring the rate of settlement of soil particles initially suspended uniformly in distilled water. The rate of settlement, which is monitored by observing the change in fluid density with the hydrometer device, is related to the size of particles settling out of suspension. Hydrometer analysis was conducted to determine the percentage of Clay & Silt Fractions in Cohesive Soil Layers, as per IS: 2720-1985 (PART-IV) (Reaffirmed-2020).

- Specific Gravity of the Soil Grains was determined using Specific Gravity bottles as per IS: 2720-1980 (Part III/Sec-01) (Reaffirmed-2021). Prior to testing, samples were ground down, if necessary, so as to pass the 2mm sieve.

- Direct Shear Tests were conducted on Sandy Samples as per IS: 2720-1983 (Part XIII) (Reaffirmed-2020) by Direct shear box apparatus which was an un-drained test. Shearing force was applied by increasing the successive load until the failure takes place. The plane of shear failure was determined and the graph was plotted. Test is used to determine Shear strength parameters like Cohesion (C) and Angle Internal Friction (ϕ).

4.2 Lab Tests on ROCK:

Tests were carried out on rock cores obtained by drilling using single tube core barrel, which were necessary to be tested in the laboratory from strength consideration. The rock samples were prepared for testing in the laboratory in accordance with IS: 9179:1979. The test results so obtained were tabulated for engineering characterization of rock samples. Water absorption, Unit Weight, point load strength Index test and uniaxial compression test on the rock samples were conducted as per relevant Indian Standards.

- Unconfined Compressive Strength (UCS): Uniaxial compressive strength (Unconfined Compressive Strength) tests were carried out in accordance with the method suggested by IS: 9143 (1979).

- Point Load Test Point Load Index test were performed on selected rock specimens (in case the sample length is not sufficient for UCS Test) in accordance with the method suggested by IS: 8764 (1998) (Reaffirmed-2019).

- Unit Weight, Specific Gravity, Absorption & Porosity: Unit Weight, Specific Gravity, Absorption & Porosity of the rock samples were determined for the selected core samples as per IS: 13030-1991 (Reaffirmed-2021).

- Water Absorption –IS 1124-1974 (Reaffirmed-2017)

- Determination of modulus of elasticity & Poisson's ratio of rock material in Uniaxial Compression (IS 9221).

5.0 SITE & SUBSURFACE CONDITIONS

5.1 Site surface description

In general, the explored locations are having natural deposit of soil and soft rock/strong rock. this soil deposit is having loose to very dense in condition. after this depth very dense completely weathered disintegrated soft rock has encountered, after the soft rock the rock having completely weathered to fresh in nature and very weak to very strong in strength has encountered. we have carried out exploratory drilling work at eight bore holes to a depth of 24.0m to 62.0m or up to hard strata/rock strata.

5.2 Subsurface material properties

The soil conditions encountered in the test borings are described briefly in the following paragraphs. The soil boring logs should be referred for more detailed description of soil condition in the test borings. The letters in parenthesis after the soil description on the boring logs in the appendix are the soil classification in accordance with the Indian Standard Classification System (IS 1498: 1970).

Eight test borings were drilled at the site to disclosed granular materials, the soil classified as Silty SAND, Sandy SILT, Sandy Lean Clay and Lean Clay with Sand description made from soil sample collected at the site.

Based on the SPT N values the investigated soil is described as loose to very dense in condition and soft rock to strong rock till the drilled depth of the borehole.

The rock encountered from the surface itself has disintegrated soft rock where no core is recovered to the rock having TCR of 8% to 100% this is present in the boreholes. The rock encountered has completely weathered to fresh in nature and has very weak to very strong in strength.

5.3 Ground water level measurement

Ground Water level observations were made after the completion of the drilling operations by 24 hours. **Ground water was encountered at a varying depth of 4.5m to 16.0m depth in various boreholes at the time of investigation.** The depth of ground water level of each borehole is mentioned in Appendix-A**.** In relatively pervious soils such as sandy soils, the indicated elevation is considered reliable groundwater level. Seasonal variations, temperature, recent rainfall may influence the groundwater table, and movement of water will depend on the permeability of the soils.

6.0 ROCK MASS CLASSIFICATION

6.1 Rock Mass Rating (RMR) System

The rock mass rating should be determined as an algebraic sum of ratings for all the parameters given in Items I to VI described below, after adjustments for orientation of discontinuities. The sum of the six parameters is the 'RMR value', which lies between 0 and 100. The code followed for RMR calculation is IS 13365-1 (1998). The detailed RMR were analyzed and included in the **Appendix C.**

Rock mass rating of the tunneling media can be computed by considering the following six parameters:

1. Uniaxial compressive strength of the intact rock
2. Rock Quality Designation (RQD).
3. Spacing of rock discontinuities
4. Condition of discontinuities
5. Ground water conditions
6. Orientation of discontinuities

1. **Uniaxial Compressive Strength of the intact rock**- is a mechanical property of rocks widely used in different engineering related projects to evaluate the stability of structures against loads. The strength of the intact rock material should be obtained from rock cores in accordance with IS 9143 or IS 8764 or IS 10785 as applicable based on-site conditions. The ratings based on uniaxial compressive strength and point load strength.
2. **Rock Quality Designation (RQD)** – is a modified percent core recovery which incorporates only sound core pieces of length that are 100 mm or more. It has also been recommended by Barton et.al. that an arbitrary value of 10 may be provided where RQD becomes) 0 or less than 10.
   RQD = (($Sum\ of\ core\ pieces\ length$ > 10 cm)/ $Total\ drill\ run$) X100
3. **Spacing of Rock Discontinuities** - The term discontinuity covers joints, beddings or foliations. shear zones, minor faults, or other surfaces of weakness. The linear distance between two adjacent discontinuities should be measured for all sets of discontinuities.
4. **Condition of Discontinuities** - This parameter includes roughness of discontinuity surfaces, their separation, length or continuity, weathering of the wall rock or the planes of weakness and infilling (gauge) material.

5. **Ground Water Conditions** - In case of tunnels, the rate of inflow of ground water in liter per minute per 10m length of the tunnel should be determined, or a general condition can be described as completely dry, damp, wet, dripping, and flowing
Rating of above five parameters is added to obtain what is called the basic rock mass rating (RMR basic).

6. **Orientation of Discontinuities** - Orientation of discontinuities means the strike and dip of discontinuities. The strike should be recorded with reference to magnetic north. The dip angle is the angle between the horizontal and the discontinuity plane taken in a direction in which the plane dips. In addition, the orientation of tunnel axis or slope face or foundation alignment should also be recorded. Once favorability of critical discontinuity is known, adjustment for orientation of discontinuities is applied to earlier obtained basic rock mass rating to obtain RMR.

The range of RMR Rating for all the six parameters are

SL No	Parameters	RMR Rating	
		Minimum	Maximum
1	Uniaxial Compressive Strength of the intact rock	0	15
2	Rock Quality Designation (RQD)	3	20
3	Spacing of Rock Discontinuities	5	20
4	Condition of Discontinuities	0	30
5	Ground Water Conditions	0	15
6	Orientation of Discontinuities		
	6.1 Tunnels	0	-12
	6.2 Foundations	0	-25
	6.3 Slopes	0	-50

On the basis of RMR values for a given engineering structure, the rock mass should be classified as shown in Table Below.

Range of Rock	Class of Rock	Category
81-100	I	Very Good
61-80	II	Good
41-60	III	Fair
21-40	IV	Poor
0-20	V	Very Poor

Considering all the above criteria for determination Rock Mass Rating (RMR) of a rock, RMR of selected samples obtained from all the test boring from ground level to up to the terminated depths of all the boreholes are estimated and tabulated in table below. The detailed RMR were analyzed, calculated and included in the **Appendix C**.

SL No	BH No	Range of RMR	Class of RMR	Category
01	BH-01	17 to 56	V to III	Very Poor to Fair
02	BH-02	19 to 59	V to III	Very Poor to Fair
03	BH-04	35 to 72	IV to II	Poor to Good
04	BH-06	34 to 72	IV to II	Poor to Good
05	BH-07	-	-	-
06	BH-10	40 to 75	IV to II	Poor to Good
07	BH-12	29	IV	Poor
08	BH-18	30 to 77	IV to II	Poor to Good

7.0 CONCLUSION

The report enumerates the factual data obtained from field records through a geotechnical investigation carried out at site. The data presented in this report specific for the boreholes drilled and time at which tests performed, it may be varied after physical checking of core boxes of boreholes drilled. Finally, it should be noted that the geotechnical data report is solely based on the drilled boreholes and field/laboratory tests that conducted, assuming that the subsurface conditions do not significantly deviate from those encountered.

In BH-01, the sub-surface condition is consisting of a soil with boulder up to 3.0m depth from the surface then stiff clayey strata obtained from 3.0m to 8.0m depth then medium dense to very dense soil obtained from 8.0m to 14.0m depth after that a very dense disintegrated soft rock encountered from 14.0m to 22.5m depth and then highly weathered very weak to fresh medium strong rock encountered from 22.5m to up to the drilled depth of 43.0m.

1. TCR ranges from-20% to 97%
2. RQD ranges from- 0% to 97%
3. UCS ranges from- 1.54 N/mm² to 32.88 N/mm²
4. RMR ranges from-17 to 56 (class -V to class -III)
5. Modulus of elasticity “E” ranges from-31089 MPa to 31245 MPa
6. Poisson ratio ranges from- 0.23 to 0.25

In BH-02, the sub-surface condition is consisting of medium stiff clayey strata from surface to 3.5m depth then medium dense to very dense soil obtained from 3.5m to 18.5m depth after that a very dense disintegrated soft rock encountered from 18.5m to 24.0m depth and then completely weathered very weak to slightly weathered medium strong rock encountered from 24.0m to up to the drilled depth of 35.0m.

1. TCR ranges from-08% to 99%
2. RQD ranges from- 0% to 99%
3. UCS ranges from- 1.67 N/mm² to 28.50 N/mm²
4. RMR ranges from-19 to 59 (class -V to class -III)
5. Modulus of elasticity “E” ranges from- 29500 MPa to 30756 MPa
6. Poisson ratio ranges from- 0.19 to 0.21

In BH-04, the sub-surface condition is medium dense soil obtained from surface to 3.5m depth after that a very dense disintegrated soft rock encountered from 3.5m to 4.5m depth and then highly weathered weak to fresh strong rock encountered from 4.5m to up to the drilled depth of 43.0m.

1. TCR ranges from-39% to 100%
2. RQD ranges from- 39% to 100%
3. UCS ranges from- 12.28N/mm² to 92.06 N/mm²
4. RMR ranges from-35 to 72 (class -IV to class -II)
5. Modulus of elasticity “E” ranges from- 57698 MPa to 63852 MPa
6. Poisson ratio ranges from- 0.18 to 0.20

In BH-06, the sub-surface condition is very dense soil obtained from surface to 2.0m depth after that a very dense disintegrated soft rock encountered from 2.0m to 3.0m depth and then moderately weathered medium strong to fresh strong rock encountered from 3.0m to up to the drilled depth of 62.0m.

1. TCR ranges from-33% to 100%
2. RQD ranges from- 33% to 100%
3. UCS ranges from- 25.43 N/mm² to 96.01 N/mm²
4. RMR ranges from-34 to 72 (class -IV to class -II)
5. Modulus of elasticity "E" ranges from- 71050 MPa to 74169 MPa
6. Poisson ratio ranges from- 0.16 to 0.18

In BH-07, the sub-surface condition is medium dense to very dense soil obtained from surface to 17.0m depth after that a very dense disintegrated soft rock encountered from 17.0m to up to the drilled depth of 24.0m.

1. TCR ranges from-0%
2. RQD ranges from- 0%
3. Modulus of elasticity "E" ranges from- 103 MPa
4. Poisson ratio ranges from- 0.30

In BH-10, the sub-surface condition is moderately weathered medium strong to fresh strong rock encountered from surface to up to the drilled depth of 42.0m.

1. TCR ranges from-45% to 100%
2. RQD ranges from- 22% to 100%
3. UCS ranges from- 27.81 N/mm² to 97.76 N/mm²
4. RMR ranges from-40 to 75 (class -IV to class -II)
5. Modulus of elasticity "E" ranges from- 66234 MPa to 70555 MPa
6. Poisson ratio ranges from- 0.19 to 0.23

In BH-12, the sub-surface condition is loose to very dense soil obtained from surface to 12.5m depth with a stiff to very stiff clay strata in between from 2.0m to 7.0m after that a very dense disintegrated soft rock encountered from 12.5m to 34.5m depth and then highly weathered very weak rock encountered from 34.5m to up to the drilled depth of 35.0m.

1. TCR ranges from-17%
2. RQD ranges from- 0.0%
3. UCS ranges from- 1.99 N/mm²
4. RMR ranges from-29 (class -IV)
5. Poisson ratio ranges from- 0.24

In BH-18, the sub-surface condition is slightly weathered weak to fresh very strong rock encountered from surface to up to the drilled depth of 40.0m.

1. TCR ranges from-44% to 100%
2. RQD ranges from- 0% to 100%
3. UCS ranges from- 6.48 N/mm² to 103.25 N/mm²
4. RMR ranges from-30 to 77 (class -IV to class -II)
5. Modulus of elasticity "E" ranges from- 65249 MPa to 68755 MPa
6. Poisson ratio ranges from- 0.17 to 0.19

8.0 LIMITATIONS OF STUDY

Differing Conditions

Our recommendations for this project were developed utilizing soils/rock information obtained from the test borings that were made at the proposed site. At this time, we would like to point out that soil/rock test borings only depict the soil/rock conditions at the specific locations and time at which they were made. The soil conditions at other locations on the site may differ from those occurring at the boring locations. If deviations from the noted subsurface conditions are encountered during construction, they should be brought to the attention of the geotechnical engineer.

Changes in Plans

The conclusion and recommendations herein have been based upon the available soil information and the preliminary design details furnished by a representative of the client of the proposed project and/or as assumed herein. Any revision in the plans for the proposed construction from those anticipated in this report should be brought to the attention of the geotechnical engineer to determine whether any changes in the foundation or earthwork recommendations are necessary.

Report Interpretation

Civil Lab and Geotech Consultants is not responsible for the conclusions, opinions, or recommendations made by others based upon the data included herein. It is the client's responsibility to seek any guidance and clarifications from our geotechnical engineer needed for proper interpretation of this report.

We hope the information provided herein will satisfy your requirements. We appreciate the opportunity to be of continued service to you in this regard. Please feel free to contact our office should you have any questions.

Yours sincerely,
FOR CIVIL LAB AND GEOTECH CONSULTANTS

MOHAMMED HABEEB
Authorized signatory

9. 0 REFERENCES

1. IS 1892: 1985 Code of practice for subsurface investigation of Foundation
2. IS 1498: 1970 Classification and Identification of soils for Gen. Eng. Purpose
3. IS 2131: 1981 Method of Standard Penetration test for soils
4. IS 2132: 1981 Code of practice for thin-walled tube sampling of soil.
5. IS 6926 - Code of Practice for Diamond Core Drilling for site investigation for river valley projects.
6. IS 4078 - Code of Practice for Indexing & storage of drill cores.
7. IS 5313: 1985 Guide for core drilling observation
8. IS 4464: 1985 Code and practice for presentation of drilling information and core description in foundation Investigation
9. IS 6403: 1981 Code for Determination of Bearing capacity of shallow foundation.
10. IS 8009:1976 Code of practice for calculation of settlement of foundation.
11. IS 12070:1987 Code and practice for design and construction of foundation on Rock.
12. IS 9179- Code of Practice for Method for preparation of rock specimen for laboratory testing.
13. IS 9143- Code of Practice for Method for determination of unconfined compressive strength of rock materials.
14. IS 9221- Code of Practice for Method for determination of modulus of elasticity & Poisson's ratio of rock material in Uniaxial Compression.
15. IS:13030-1991 - Method of Test for Laboratory Determination of Water Content, Porosity, Density and Related Properties of Rock Material.
16. IS:8764-1998 - Method for Determination of Point Load Strength Index of Rocks
17. ISRM - International Society of Rock Mechanics.
18. IS:13365 (Part-I)-1998 - Quantitative Classification Systems of Rock Mass – Guidelines
19. Foundation Analysis and Design by Bowels.

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APPENDIX-A

BORELOG DETAILS

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APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 01**
Location:	**Bethel Church,Hebbal, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**05.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**43.00**	Ending date:	**15.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13.0421900
Ground water depth(m) :	**5.5m**			Easting	77.5963115

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5									
1.0									
1.5	RUN 1	-	-	-	-	Greyish Brown Boulders			
2.0									
2.5									
3.0	RUN 2	-	-	-	-	Greyish Brown Boulders			
3.5									
4.0									
4.5	SPT 1	3	4	6	10	Stiff Greyish Sandy Lean Clay			
5.0									
5.5									
6.0	SPT 2	4	6	7	13	Stiff Greyish Sandy Lean Clay			
6.5									
7.0									
7.5	SPT 3	5	7	9	16	Stiff Greyish Sandy Lean Clay			
8.0									
8.5									
9.0	SPT 4	6	8	10	18	Medium Dense Yellowish Grey Sandy SILT			
9.5									
10.0									

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APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 01**
Location:	**Bethel Church,Hebbal, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**05.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**43.00**	Ending date:	**15.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13.0421900
Ground water depth(m) :	**5.5m**			Easting	77.5963115

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5	SPT 5	7	10	13	**23**	Medium Dense Yellowish Grey Sandy SILT			
11.0									
11.5									
12.0	SPT 6	7	11	12	**23**	Medium Dense Yellowish Grey Sandy SILT			
12.5									
13.0									
13.5	SPT 7	21	27	39	**66**	Very Dense Greyish Yellow Silty SAND			
14.0									
14.5									
15.0	SPT 8	23	38	50/ 10cm	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
15.5									
16.0									
16.5	SPT 9	50/ 5cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
17.0									
17.5									
18.0	SPT 10	50/ 6cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
18.5									
19.0									
19.5	SPT 11	50/ 4cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
20.0									
20.5									
21.0	SPT 12	50/ 4cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
21.5									
22.0									

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 01**
Location:	**Bethel Church,Hebbal, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**05.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**43.00**	Ending date:	**15.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13.0421900
Ground water depth(m) :	**5.5m**			Easting	77.5963115

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
22.5	SPT 13	50/ 4cm	R	R	R	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
23.0 23.5 24.0	RUN 3	-	-	-	-	Highly Weathered Brownish Pink Very Weak Rock		20%	Nill
24.5 25.0 25.5	RUN 4	-	-	-	-	Highly Weathered Brownish Pink Very Weak Rock		35%	Nill
26.0 26.5 27.0	RUN 13	-	-	-	-	Highly Weathered Brownish Pink Very Weak Rock		31%	Nill
27.5 28.0 28.5	RUN 14	-	-	-	-	Highly Weathered Brownish Pink Very Weak Rock		30%	Nill
29.0 29.5 30.0	RUN 15	-	-	-	-	Highly Weathered Brownish Pink Weak Rock		45%	Nill
30.5 31.0 31.5	RUN 16	-	-	-	-	Highly Weathered Brownish Pink Weak Rock		42%	Nill
32.0 32.5 33.0	RUN 17	-	-	-	-	Moderately Weathred Brownish Pink Weak Rock		43%	22%
33.5 34.0 34.5	RUN 18	-	-	-	-	Moderately Weathred Brownish Pink Weak Rock		54%	24%
35.0 35.5 36.0	RUN 19	-	-	-	-	Slightly Weathered Brownish Pink Weak Rock		87%	63%
36.5 37.0 37.5	RUN 20	-	-	-	-	Fresh Brownish Pink Weak Rock		83%	83%
38.0 38.5 39.0	RUN 21	-	-	-	-	Fresh Brownish Pink Medium Strong Rock		99%	93%
39.5 40.0 40.5	RUN 22	-	-	-	-	Fresh Brownish Pink Medium Strong Rock		96%	96%

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**			Report No.	**24G0291**	Boring No.	**BH- 01**
Location:	**Bethel Church,Hebbal, Bengaluru.**			Elevation (m):	**0.0**	Starting date:	**05.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**			Boring Depth (m)	**43.00**	Ending date:	**15.03.2025**
Method of boring:	**Mechanical Rotary Drilling**			Coordinates		Northing	13.0421900
Ground water depth(m) :	**5.5m**					Easting	77.5963115

Depth (m)	**Sample No.**	**SPT Blows/15cm**			**"N" value**	**Description of Strata**	**Legend**	**Total core recovery**	**Rock Quality Designation**
0.0		**15**	**30**	**45**				**TCR (%)**	**RQD (%)**
41.0 41.5 42.0	RUN 23	-	-	-	**-**	Fresh Brownish Pink Medium Strong Rock		95%	95%
42.5 43.0	RUN 24	-	-	-	**-**	Fresh Brownish Pink Medium Strong Rock		97%	97%

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 43.0 Meters.	RUN	Rock Coring
DS	Disturbed sample		GWL	Ground water level
SPT	Standard penetration test		Logged by	AA
R	Refusal- N value >50		Checked by	MH

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 02**
Location:	**Opp Bethel Church, Hebbal, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**24.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**35.00**	Ending date:	**27.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13˚ 02' 33" N
Ground water depth(m) :	**15.00**			Easting	77˚ 35' 30" E

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5									
1.0									
1.5	SPT 1	2	3	3	**6**	Medium Stiff Greyish Lean Clay with Sand			
2.0									
2.5									
3.0	SPT 2	3	3	5	**8**	Medium Stiff Greyish Fat Clay with Sand			
3.5									
4.0									
4.5	SPT 3	4	7	11	**18**	Medium Dense Brownish Sandy SILT			
5.0									
5.5									
6.0	SPT 4	5	10	15	**25**	Medium Dense Brownish Silty SAND			
6.5									
7.0									
7.5	SPT 5	6	9	11	**20**	Medium Dense Brownish Silty SAND			
8.0									
8.5									
9.0	SPT 6	8	13	16	**29**	Medium Dense Brownish Silty SAND			
9.5									
10.0									

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 02**
Location:	**Opp Bethel Church, Hebbal, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**24.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**35.00**	Ending date:	**27.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13˚ 02' 33" N
Ground water depth(m) :	**15.00**			Easting	77˚ 35' 30" E

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5	SPT 7	12	15	18	**33**	Dense Brownish Silty SAND			
11.0									
11.5									
12.0	SPT 8	13	19	22	**41**	Dense Brownish Silty SAND			
12.5									
13.0									
13.5	SPT 9	16	16	27	**43**	Dense Greyish White Silty SAND			
14.0									
14.5									
15.0	SPT 10	26	50/ 12cm	R	**R**	Very Dense Greyish White Silty SAND			
15.5									
16.0									
16.5	SPT 11	29	50/ 11cm	R	**R**	Very Dense Greyish White Silty SAND			
17.0									
17.5									
18.0	SPT 12	50/ 8cm	R	R	**R**	Very Dense Greyish White Silty SAND			
18.5									
19.0									
19.5	SPT 13	50/ 3cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Grey Rock (Washed Sample)			
20.0									
20.5									
21.0	SPT 14	50/ 3cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Grey Rock (Washed Sample)			
21.5									
22.0									

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 02**
Location:	**Opp Bethel Church, Hebbal, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**24.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**35.00**	Ending date:	**27.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13˚ 02' 33" N
Ground water depth(m) :	**15.00**			Easting	77˚ 35' 30" E

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
22.5	SPT 15	50/ 3cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Grey Rock (Washed Sample)			
23.0									
23.5									
24.0	RUN 16	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Grey Rock (Washed Sample)			
24.5									
25.0	RUN 1	-	-	-	-	Completely Weathered Whitish Brown Very Weak Rock		8%	Nill
25.5									
26.0									
26.5	RUN 2	-	-	-	-	Completely Weathered Whitish Brown Very Weak Rock		13%	Nill
27.0									
27.5									
28.0	RUN 3	-	-	-	-	Highly Weathered Whitish Brown Very Weak Rock		17%	16%
28.5									
29.0									
29.5	RUN 4	-	-	-	-	Highly Weathered Whitish Brown Very Weak Rock		13%	Nill
30.0									
30.5									
31.0	RUN 5	-	-	-	-	Moderately Weathered Whitish Brown Weak Rock		43%	29%
31.5									
32.0									
32.5	RUN 6	-	-	-	-	Slightly Weathered Whitish Brown Medium Strong Rock		46%	21%
33.0									
33.5									
34.0	RUN 7	-	-	-	-	Slightly Weathered Whitish Brown Medium Strong Rock		95%	94%
34.5									
35.0	RUN 8	-	-	-	-	Slightly Weathered Whitish Brown Medium Strong Rock		99%	99%

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 35.0 Meters.	RUN / Rock Coring
DS	Disturbed sample		GWL / Ground water level
SPT	Standard penetration test		Logged by / AA
R	Refusal- N value >50		Checked by / MH

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 04**
Location:	**Race Course, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**24.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**43.00**	Ending date:	**04.04.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1436422.875
Ground water depth(m) :	**8.3m**			Easting	780039.119

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5 1.0 1.5 2.0	SPT 1	3	6	8	**14**	Medium Dense Yellowish Grey Silty SAND			
2.5 3.0 3.5	SPT 2	5	6	10	**16**	Medium Dense Yellowish Grey Silty SAND			
4.0 4.5	SPT 3	50/ 5cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Grey Rock (Washed Sample)			
5.0 5.5 6.0	RUN 1	-	-	-	**-**	Highly Weathered Whitish Grey Weak Rock		39%	39%
6.5 7.0 7.5	RUN 2	-	-	-	**-**	Moderately Weathered Whitish Grey Weak Rock		81%	81%
8.0 8.5 9.0	RUN 3	-	-	-	**-**	Slightly Weathered Whitish Grey Weak Rock		91%	91%
9.5 10.0	RUN 4	-	-	-	**-**	Fresh Whitish Grey Weak Rock		85%	73%

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 04**
Location:	**Race Course, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**24.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**43.00**	Ending date:	**04.04.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1436422.875
Ground water depth(m) :	**8.3m**			Easting	780039.119

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5									
11.0									
11.5	RUN 5	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		91%	91%
12.0									
12.5									
13.0	RUN 6	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		89%	85%
13.5									
14.0									
14.5	RUN 7	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		91%	91%
15.0									
15.5									
16.0	RUN 8	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		90%	90%
16.5									
17.0									
17.5	RUN 9	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		91%	91%
18.0									
18.5									
19.0	RUN 10	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		93%	93%
19.5									
20.0									
20.5	RUN 11	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		95%	95%
21.0									
21.5									
22.0	RUN 12	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		95%	95%
22.5									
23.0									
23.5	RUN 13	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		100%	100%
24.0									
24.5									
25.0	RUN 14	-	-	-	-	Fresh Whitish Grey Medium Strong Rock		100%	100%
25.5									
26.0									
26.5	RUN 15	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
27.0									
27.5									
28.0	RUN 16	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
28.5									
29.0									
29.5	RUN 17	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
30.0									
30.5									
31.0	RUN 18	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
31.5									
32.0									
32.5	RUN 19	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
33.0									

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 04**
Location:	**Race Course, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**24.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**43.00**	Ending date:	**04.04.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1436422.875
Ground water depth(m) :	**8.3m**			Easting	780039.119

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
33.5									
34.0	RUN 20	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
34.5									
35.0									
35.5	RUN 21	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
36.0									
36.5									
37.0	RUN 22	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
37.5									
38.0									
38.5	RUN 23	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
39.0									
39.5									
40.0	RUN 24	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
40.5									
41.0									
41.5	RUN 25	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%
42.0									
42.5									
43.0	RUN 26	-	-	-	-	Fresh Whitish Grey Strong Rock		100%	100%

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 43.0 Meters.	RUN / Rock Coring
DS	Disturbed sample		GWL / Ground water level
SPT	Standard penetration test		Logged by: AA
R	Refusal- N value >50		Checked by: MH

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**			Report No.	**24G0291**	Boring No.	**BH- 06**
Location:	**Bengaluru City University, Bengaluru**			Elevation (m):	**0.0**	Starting date:	**20.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**			Boring Depth (m)	**62.00**	Ending date:	**04.03.2025**
Method of boring:	**Mechanical Rotary Drilling**			Coordinates		Northing	1435873.311
Ground water depth(m) :	**4.5m**					Easting	780019.095

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5 1.0 1.5 2.0	SPT 1	17	36	50/ 8cm	**R**	Very Dense Brownish Grey Silty SAND			
2.5 3.0	SPT 2	50/ 4cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Greyish Brown Soft Rock (Washed Sample)			
3.5 4.0 4.5	RUN 1	-	-	-	**-**	Slightly Weathered Greyish White Medium Strong Rock		83%	83%
5.0 5.5 6.0	RUN 2	-	-	-	**-**	Slightly Weathered Greyish White Medium Strong Rock		65%	65%
6.5 7.0 7.5	RUN 3	-	-	-	**-**	Slightly Weathered Greyish White Medium Strong Rock		72%	67%
8.0 8.5 9.0	RUN 4	-	-	-	**-**	Moderately Weathered Greyish White Medium Strong Rock		53%	50%
9.5 10.0	RUN 5	-	-	-	**-**	Moderately Weathered Greyish		33%	33%

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 06**
Location:	**Bengaluru City University, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**20.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**62.00**	Ending date:	**04.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1435873.311
Ground water depth(m) :	**4.5m**			Easting	780019.095

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5						White Medium Strong Rock			
11.0									
11.5	RUN 6	-	-	-	-	Moderately Weathered Greyish White Medium Strong Rock		47%	33%
12.0									
12.5									
13.0	RUN 7	-	-	-	-	Moderately Weathered Greyish White Medium Strong Rock		45%	41%
13.5									
14.0									
14.5	RUN 8	-	-	-	-	Moderately Weathered Greyish White Medium Strong Rock		41%	41%
15.0									
15.5									
16.0	RUN 9	-	-	-	-	Fresh Greyish White Medium Strong Rock		80%	73%
16.5									
17.0									
17.5	RUN 10	-	-	-	-	Fresh Greyish White Medium Strong Rock		73%	73%
18.0									
18.5									
19.0	RUN 11	-	-	-	-	Fresh Greyish White Strong Rock		91%	91%
19.5									
20.0									
20.5	RUN 12	-	-	-	-	Fresh Greyish White Strong Rock		87%	87%
21.0									
21.5									
22.0	RUN 13	-	-	-	-	Fresh Greyish White Strong Rock		91%	91%
22.5									
23.0									
23.5	RUN 14	-	-	-	-	Fresh Greyish White Strong Rock		97%	97%
24.0									
24.5									
25.0	RUN 15	-	-	-	-	Fresh Greyish White Strong Rock		95%	95%
25.5									
26.0									
26.5	RUN 16	-	-	-	-	Fresh Greyish White Strong Rock		96%	96%
27.0									
27.5									
28.0	RUN 17	-	-	-	-	Fresh Greyish White Strong Rock		96%	96%
28.5									
29.0									
29.5	RUN 18	-	-	-	-	Fresh Greyish White Strong Rock		97%	97%
30.0									
30.5									
31.0	RUN 19	-	-	-	-	Fresh Greyish White Strong Rock		97%	97%
31.5									
32.0									
32.5	RUN 20	-	-	-	-	Fresh Greyish White Strong Rock		98%	98%
33.0									

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 06**
Location:	**Bengaluru City University, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**20.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**62.00**	Ending date:	**04.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1435873.311
Ground water depth(m) :	**4.5m**			Easting	780019.095

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
33.5									
34.0	RUN 21	-	-	-	-	Fresh Greyish White Strong Rock		98%	98%
34.5									
35.0									
35.5	RUN 22	-	-	-	-	Fresh Greyish White Strong Rock		98%	98%
36.0									
36.5									
37.0	RUN 23	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
37.5									
38.0									
38.5	RUN 24	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
39.0									
39.5									
40.0	RUN 25	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
40.5									
41.0									
41.5	RUN 26	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
42.0									
42.5									
43.0	RUN 27	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
43.5									
44.0									
44.5	RUN 28	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
45.0									
45.5									
46.0	RUN 29	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
46.5									
47.0									
47.5	RUN 30	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
48.0									
48.5									
49.0	RUN 31	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
49.5									
50.0									
50.5	RUN 32	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
51.0									
51.5									
52.0	RUN 33	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
52.5									
53.0									
53.5	RUN 34	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
54.0									
54.5									
55.0	RUN 35	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
55.5									
56.0									
56.5	RUN 36	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 06**
Location:	**Bengaluru City University, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**20.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**62.00**	Ending date:	**04.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1435873.311
Ground water depth(m) :	**4.5m**			Easting	780019.095

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
57.0 57.5 58.0 58.5	RUN 37	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
59.0 59.5 60.0	RUN 38	-	-	-	-	Fresh Greyish White Strong Rock		100%	90%
60.5 61.0 61.5	RUN 39	-	-	-	-	Fresh Greyish White Strong Rock		100%	86%
62.0	RUN 40	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 62.0 Meters.		RUN	Rock Coring
DS	Disturbed sample			GWL	Ground water level
SPT	Standard penetration test			Logged by	AA
R	Refusal- N value >50			Checked by	MH

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 07**
Location:	**Banappa Park, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**07.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**24.00**	Ending date:	**09.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1435233.735
Ground water depth(m) :	**15.0m**			Easting	780421.946

Depth (m)	**Sample No.**	**SPT Blows/15cm**			**"N" value**	**Description of Strata**	**Legend**	**Total core recovery**	**Rock Quality Designation**
0.0		**15**	**30**	**45**				**TCR (%)**	**RQD (%)**
0.5									
1.0									
1.5	SPT 1	5	6	7	**13**	Medium Dense Reddish Silty SAND			
2.0									
2.5									
3.0	SPT 2	6	9	11	**20**	Medium Dense Reddish Silty SAND			
3.5									
4.0									
4.5	SPT 3	9	11	15	**26**	Medium Dense Brownish Yellow Silty SAND			
5.0									
5.5									
6.0	SPT 4	9	13	17	**30**	Dense Yellowish Silty SAND			
6.5									
7.0									
7.5	SPT 5	12	14	18	**32**	Dense Yellowish Silty SAND			
8.0									
8.5									
9.0	SPT 6	13	17	26	**43**	Dense Yellowish Silty SAND			
9.5									
10.0									

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 07**
Location:	**Banappa Park, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**07.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**24.00**	Ending date:	**09.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1435233.735
Ground water depth(m) :	**15.0m**			Easting	780421.946

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5	SPT 7	21	31	42	**73**	Very Dense Yellowish Silty SAND			
11.0									
11.5									
12.0	SPT 8	33	50/ 13cm	R	**R**	Very Dense Greyish White Silty SAND			
12.5									
13.0									
13.5	SPT 9	50/ 14cm	R	R	**R**	Very Dense Greyish White Silty SAND			
14.0									
14.5									
15.0	SPT 10	50/ 12cm	R	R	**R**	Very Dense Greyish White Silty SAND			
15.5									
16.0									
16.5	SPT 11	50/ 10cm	R	R	**R**	Very Dense Greyish White Silty SAND			
17.0									
17.5									
18.0	SPT 12	50/ 4cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
18.5									
19.0									
19.5	SPT 13	50/ 3cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
20.0									
20.5									
21.0	SPT 12	50/ 3cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
21.5									
22.0									

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 07**
Location:	**Banappa Park, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**07.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**24.00**	Ending date:	**09.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1435233.735
Ground water depth(m) :	**15.0m**			Easting	780421.946

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
22.5	SPT 14	50/ 3cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
23.0									
23.5	RUN 15	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
24.0									

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 24.0 Meters.	RUN / Rock Coring
DS	Disturbed sample		GWL / Ground water level
SPT	Standard penetration test		Logged by / AA
R	Refusal- N value >50		Checked by / MH

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 10**
Location:	**Lal Bagh, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**24.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**42.00**	Ending date:	**05.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1432660.916
Ground water depth(m) :	**Nill**			Easting	780923.860

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5 1.0 1.5	RUN 1	-	-	-	-	Moderately Weathered Greyish White Medium Strong Rock		45%	22%
2.0 2.5 3.0	RUN 2	-	-	-	-	Slightly Weathered Greyish White Medium Strong Rock		73%	69%
3.5 4.0 4.5	RUN 3	-	-	-	-	Slightly Weathered Greyish White Medium Strong Rock		63%	63%
5.0 5.5 6.0	RUN 4	-	-	-	-	Fresh Greyish White Medium Strong Rock		79%	79%
6.5 7.0 7.5	RUN 5	-	-	-	-	Fresh Greyish White Medium Strong Rock		71%	71%
8.0 8.5 9.0	RUN 6	-	-	-	-	Fresh Greyish White Medium Strong Rock		65%	65%
9.5 10.0	RUN 7	-	-	-	-	Fresh Greyish White Medium		85%	85%

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 10**
Location:	**Lal Bagh, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**24.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**42.00**	Ending date:	**05.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1432660.916
Ground water depth(m) :	**Nill**			Easting	780923.860

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5						Strong Rock			
11.0									
11.5	RUN 8	-	-	-	-	Fresh Greyish White Medium Strong Rock		85%	85%
12.0									
12.5									
13.0	RUN 9	-	-	-	-	Fresh Greyish White Medium Strong Rock		91%	87%
13.5									
14.0									
14.5	RUN 10	-	-	-	-	Fresh Greyish White Medium Strong Rock		73%	73%
15.0									
15.5									
16.0	RUN 11	-	-	-	-	Fresh Greyish White Medium Strong Rock		71%	71%
16.5									
17.0									
17.5	RUN 12	-	-	-	-	Fresh Greyish White Medium Strong Rock		53%	53%
18.0									
18.5									
19.0	RUN 13	-	-	-	-	Fresh Greyish White Medium Strong Rock		48%	48%
19.5									
20.0									
20.5	RUN 14	-	-	-	-	Fresh Greyish White Strong Rock		65%	61%
21.0									
21.5									
22.0	RUN 15	-	-	-	-	Fresh Greyish White Strong Rock		62%	61%
22.5									
23.0									
23.5	RUN 16	-	-	-	-	Fresh Greyish White Strong Rock		58%	51%
24.0									
24.5									
25.0	RUN 17	-	-	-	-	Fresh Greyish White Strong Rock		62%	62%
25.5									
26.0									
26.5	RUN 18	-	-	-	-	Fresh Greyish White Strong Rock		86%	86%
27.0									
27.5									
28.0	RUN 19	-	-	-	-	Fresh Greyish White Strong Rock		99%	99%
28.5									
29.0									
29.5	RUN 20	-	-	-	-	Fresh Greyish White Strong Rock		97%	97%
30.0									
30.5									
31.0	RUN 21	-	-	-	-	Fresh Greyish White Strong Rock		99%	99%
31.5									
32.0									
32.5	RUN 22	-	-	-	-	Fresh Greyish White Strong Rock		99%	99%
33.0									

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 10**
Location:	**Lal Bagh, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**24.02.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**42.00**	Ending date:	**05.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	1432660.916
Ground water depth(m) :	**Nill**			Easting	780923.860

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
33.5 34.0 34.5	RUN 23	-	-	-	-	Fresh Greyish White Strong Rock		92%	83%
35.0 35.5 36.0	RUN 24	-	-	-	-	Fresh Greyish White Strong Rock		98%	98%
36.5 37.0 37.5	RUN 25	-	-	-	-	Fresh Greyish White Strong Rock		99%	99%
38.0 38.5 39.0	RUN 26	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
39.5 40.0 40.5	RUN 27	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
41.0 41.5 42.0	RUN 28	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 42.0 Meters.		RUN	Rock Coring
DS	Disturbed sample			GWL	Ground water level
SPT	Standard penetration test			Logged by	AA
R	Refusal- N value >50			Checked by	MH

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 12**
Location:	**Opp Bethel Church, Hebbal, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**29.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**35.00**	Ending date:	**31.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13˚ 02' 33" N
Ground water depth(m) :	**16.0m**			Easting	77˚ 35' 52" E

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5									
1.0									
1.5	SPT 1	2	3	3	**6**	Loose Greyish Sandy SILT			
2.0									
2.5									
3.0	SPT 2	5	6	11	**17**	Very Stiff Greyish Sandy Lean Clay			
3.5									
4.0									
4.5	SPT 3	5	6	8	**14**	Stiff Greyish Sandy Lean Clay			
5.0									
5.5									
6.0	SPT 4	8	10	12	**22**	Very Stiff Greyish Sandy Lean Clay			
6.5									
7.0									
7.5	SPT 5	7	11	12	**23**	Medium Dense Brownish Sandy SILT			
8.0									
8.5									
9.0	SPT 6	8	12	14	**26**	Medium Dense Brownish Silty SAND			
9.5									
10.0									

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APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 12**
Location:	**Opp Bethel Church, Hebbal, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**29.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**35.00**	Ending date:	**31.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13˚ 02' 33" N
Ground water depth(m) :	**16.0m**			Easting	77˚ 35' 52" E

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5	SPT 7	16	20	26	**46**	Dense Brownish Silty SAND			
11.0									
11.5									
12.0	SPT 8	27	50/ 12cm	R	**R**	Very Dense Brownish Silty SAND			
12.5									
13.0									
	SPT 9	50/ 5cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
13.5									
14.0									
14.5									
	SPT 10	50/ 5cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
15.0									
15.5									
16.0									
	SPT 11	50/ 4cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
16.5									
17.0									
17.5									
	SPT 12	50/ 4cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
18.0									
18.5									
19.0									
	SPT 13	50/ 4cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
19.5									
20.0									
20.5									

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 12**
Location:	**Opp Bethel Church, Hebbal, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**29.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**35.00**	Ending date:	**31.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13˚ 02' 33" N
Ground water depth(m) :	**16.0m**			Easting	77˚ 35' 52" E

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
21.0	SPT 14	50/ 3cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
21.5									
22.0									
22.5	SPT 15	50/ 3cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
23.0									
23.5									
24.0	RUN 16	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
24.5									
25.0									
25.5	RUN 17	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
26.0									
26.5									
27.0	RUN 18	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
27.5									
28.0									
28.5	RUN 19	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
29.0									
29.5									
30.0	RUN 20	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
30.5									
31.0									

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APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 12**
Location:	**Opp Bethel Church, Hebbal, Bengaluru.**	Elevation (m):	**0.0**	Starting date:	**29.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**35.00**	Ending date:	**31.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13˚ 02' 33" N
Ground water depth(m) :	**16.0m**			Easting	77˚ 35' 52" E

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
31.5	RUN 21	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
32.0									
32.5									
33.0	RUN 22	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
33.5									
34.0									
34.5	RUN 23	50/ 2cm	R	R	**R**	Very Dense Completely Weathered Disintegrated Brownish Rock (Washed Sample)			
35.0	RUN 1	-	-	-	**-**	Highly Weathered Greyish Very Weak Rock		17%	Nill

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 35.0 Meters.	RUN / Rock Coring
DS	Disturbed sample		GWL / Ground water level
SPT	Standard penetration test		Logged by / AA
R	Refusal- N value >50		Checked by / MH

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 18**
Location:	**Atria University, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**09.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**40.00**	Ending date:	**20.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13˚ 01' 59.8" N
Ground water depth(m) :	**7.5m**			Easting	77˚ 35'32.1" E

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
0.5 1.0 1.5	RUN 1	-	-	-	-	Slightly Weathered Greyish White Weak Rock		44%	Nill
2.0 2.5 3.0	RUN 2	-	-	-	-	Fresh Greyish White Medium Strong Rock		71%	71%
3.5 4.0 4.5	RUN 3	-	-	-	-	Fresh Greyish White Medium Strong Rock		65%	65%
5.0 5.5 6.0	RUN 4	-	-	-	-	Fresh Greyish White Medium Strong Rock		74%	74%
6.5 7.0 7.5	RUN 5	-	-	-	-	Fresh Greyish White Medium Strong Rock		87%	77%
8.0 8.5 9.0	RUN 6	-	-	-	-	Fresh Greyish White Medium Strong Rock		93%	86%
9.5 10.0	RUN 7	-	-	-	-	Fresh Greyish White Medium		99%	99%

APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 18**
Location:	**Atria University, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**09.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**40.00**	Ending date:	**20.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13˚ 01' 59.8" N
Ground water depth(m) :	**7.5m**			Easting	77˚ 35'32.1" E

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
10.5						Strong Rock			
11.0									
11.5	RUN 8	-	-	-	-	Fresh Greyish White Medium Strong Rock		83%	83%
12.0									
12.5									
13.0	RUN 9	-	-	-	-	Fresh Greyish White Medium Strong Rock		91%	91%
13.5									
14.0									
14.5	RUN 10	-	-	-	-	Fresh Greyish White Medium Strong Rock		91%	91%
15.0									
15.5									
16.0	RUN 11	-	-	-	-	Fresh Greyish White Medium Strong Rock		90%	90%
16.5									
17.0									
17.5	RUN 12	-	-	-	-	Fresh Greyish White Medium Strong Rock		95%	95%
18.0									
18.5									
19.0	RUN 13	-	-	-	-	Fresh Greyish White Medium Strong Rock		93%	93%
19.5									
20.0									
20.5	RUN 14	-	-	-	-	Fresh Greyish White Medium Strong Rock		98%	98%
21.0									
21.5									
22.0	RUN 15	-	-	-	-	Fresh Greyish White Strong Rock		91%	91%
22.5									
23.0									
23.5	RUN 16	-	-	-	-	Fresh Greyish White Strong Rock		99%	99%
24.0									
24.5									
25.0	RUN 17	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
25.5									
26.0									
26.5	RUN 18	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
27.0									
27.5									
28.0	RUN 19	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
28.5									
29.0									
29.5	RUN 20	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
30.0									
30.5									
31.0	RUN 21	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
31.5									
32.0									
32.5	RUN 22	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
33.0									

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APPENDIX-A

E X P L O R A T O R Y B O R I N G L O G

Project:	**Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction**	Report No.	**24G0291**	Boring No.	**BH- 18**
Location:	**Atria University, Bengaluru**	Elevation (m):	**0.0**	Starting date:	**09.03.2025**
Customer:	**M/s. Rodic Consultants Pvt Ltd**	Boring Depth (m)	**40.00**	Ending date:	**20.03.2025**
Method of boring:	**Mechanical Rotary Drilling**	Coordinates		Northing	13˚ 01' 59.8" N
Ground water depth(m) :	**7.5m**			Easting	77˚ 35'32.1" E

Depth (m)	Sample No.	SPT Blows/15cm			"N" value	Description of Strata	Legend	Total core recovery	Rock Quality Designation
0.0		15	30	45				TCR (%)	RQD (%)
33.5 34.0 34.5	RUN 23	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
35.0 35.5 36.0	RUN 24	-	-	-	-	Fresh Greyish White Strong Rock		100%	100%
36.5 37.0 37.5	RUN 25	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
38.0 38.5 39.0	RUN 26	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%
39.5 40.0	RUN 27	-	-	-	-	Fresh Greyish White Very Strong Rock		100%	100%

UDS	Undisturbed sample	Remarks:-Borehole Terminated At 40.0 Meters.		RUN	Rock Coring
DS	Disturbed sample			GWL	Ground water level
SPT	Standard penetration test			Logged by	AA
R	Refusal- N value >50			Checked by	MH

APPENDIX-A-1

GEOLOGICAL BORELOG DETAILS

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GEOLOGICAL LOG OF BOREHOLE: BH - 01

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Bethel Church,Hebbal, Bengaluru.	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT		
STARTED	05.03.2025	COLLAR ELEVATION:		100.12		
COMPLETED	15.03.2025	Co-Ordinates:	Easting	13.04219		
TOTAL DEPTH	43.00		Northing	77.5963115		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Boulders		VI	Loose	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	-	-	-	-	-	62.5	
1.50	3.00	Boulders		VI	Loose	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	-	-	-	-	-	50.0	
3.00	4.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	3	4	6	**10**	125.0	
4.50	6.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	Δ GWL-5.5m	Grey		-	-	4	6	7	**13**	166.7	
6.00	7.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	5	7	9	**16**	83.3	
7.50	9.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	6	8	10	**18**	71.4	
9.00	10.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	7	10	13	**23**	71.4	
10.50	12.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	7	11	12	**23**	125.0	
12.00	13.50	Soil		VI	Vry Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	21	27	39	**66**	62.5	
13.50	15.00	Soil		V	Vry Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	23	38	50/ 10cm	**R**	31.3	
15.00	16.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Vry Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 5cm	R	R	**R**	29.4	
16.50	18.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Vry Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 6cm	R	R	**R**	29.8	
18.00	19.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Vry Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 4cm	R	R	**R**	27.8	
19.50	21.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Vry Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 4cm	R	R	**R**	22.7	The Soft Rock encountered after 14.0m depth. The Rockmass encountered is Hard Granitic Gneiss from

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GEOLOGICAL LOG OF BOREHOLE: BH - 01

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Bethel Church,Hebbal, Bengaluru.	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT		
STARTED	05.03.2025	COLLAR ELEVATION:		100.12		
COMPLETED	15.03.2025	Co-Ordinates:	Easting	13.04219		
TOTAL DEPTH	43.00		Northing	77.5963115		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
21.00	22.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Vry Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey	-		-	50/ 4cm	R	R	R	26.3	22.5m depth. Ground Water Level Encountered at 5.5m depth.
22.50	24.00	Highly Weathered Granitic Gneiss		IV	Very Weak Rock	24°	0.30		-	-	-	-	20	0.00	0		NX		Grey	-	-		-	-	-	-	17.9	
24.00	25.50	Highly Weathered Granitic Gneiss		IV	Very Weak Rock	31°	0.53			-	-	-	35	0.00	0		NX		Grey	-	-		-	-	-	-	13.9	
25.50	27.00	Highly Weathered Granitic Gneiss		IV	Very Weak Rock	28°	0.47			-	-	-	31	0.00	0		NX		Grey	-	-		-	-	-	-	13.2	
27.00	28.50	Highly Weathered Granitic Gneiss		IV	Very Weak Rock	17°	0.45			-	-	-	30	0.00	0		NX		Grey	-	-		-	-	-	-	12.8	
28.50	30.00	Highly Weathered Granitic Gneiss		IV	Weak Rock	29°	0.68				-	-	45	0.00	0		NX		Grey	-		-	-	-	-	-	11.9	
30.00	31.50	Highly Weathered Granitic Gneiss		IV	Weak Rock	24°	0.63				-	-	42	0.00	0		NX		Grey	-		-	-	-	-	-	12.5	
31.50	33.00	Moderately Weathered Granitic Gneiss		III	Weak Rock	15°	0.65				-	-	43	0.33	22		NX		Grey	-		-	-	-	-	-	12.5	
33.00	34.50	Moderately Weathered Granitic Gneiss		III	Weak Rock	20°	0.81				-	-	54	0.36	24		NX		Grey	-		-	-	-	-	-	11.9	
34.50	36.00	Slightly Weathered Granitic Gneiss		II	Weak Rock	12°	1.31						87	0.95	63		NX		Grey		-	-	-	-	-	-	11.6	
36.00	37.50	Fresh, Granitic Gneiss		I	Weak Rock	9°	1.25						83	1.25	83		NX		Grey		-	-	-	-	-	-	12.5	
37.50	39.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	12°	1.49						99	1.40	93		NX		Grey		-	-	-	-	-	-	11.6	
39.00	40.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	8°	1.44						96	1.44	96		NX		Grey		-	-	-	-	-	-	10.4	
40.50	42.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	10°	1.43						95	1.43	95		NX		Grey		-	-	-	-	-	-	9.6	
42.00	43.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	7°	1.46						97	1.46	97		NX		Grey		-	-	-	-	-	-	6.3	

SOIL		Disintegrated Rock	Granitic Gneseiss

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GEOLOGICAL LOG OF BOREHOLE: BH - 02

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Opp Bethel Church, Hebbal, Bengaluru.	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	24.03.2025	COLLAR ELEVATION:		100.12	
COMPLETED	27.03.2025	Co-Ordinates:	Easting	77° 35' 30" E	
TOTAL DEPTH	35.00		Northing	13° 02' 33" N	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Soil		VI	Loose	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	2	3	3	**6**	100.0	
1.50	3.00	Soil		VI	Loose	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	3	3	5	**8**	100.0	
3.00	4.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	4	7	11	**18**	80.6	
4.50	6.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	5	10	15	**25**	75.8	
6.00	7.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	6	9	11	**20**	71.4	
7.50	9.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	8	13	16	**29**	62.5	
9.00	10.50	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	12	15	18	**33**	50.0	
10.50	12.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	13	19	22	**41**	55.6	
12.00	13.50	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	16	16	27	**43**	55.6	
13.50	15.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	26	50/ 12cm	R	**R**	50.0	
15.00	16.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	Δ GWL-15.0m	Grey		-	-	29	50/ 12cm	R	**R**	50.0	
16.50	18.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 8cm	R	R	**R**	41.7	
18.00	19.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--	NX	NX		Grey		-	-	50/ 3cm	R	R	**R**	35.7	The Soft Rock encountered after 18.5m depth. The Rockmass encountered is Hard Granitic Gneiss from 24.0m depth. Ground Water Level Encountered at 15.0m depth.
19.50	21.00	Completely Weathered Disintegrated Brownish Grey Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 3cm	R	R	**R**	31.3	

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GEOLOGICAL LOG OF BOREHOLE: BH - 02

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Opp Bethel Church, Hebbal, Bengaluru.	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT		
STARTED	24.03.2025	COLLAR ELEVATION:		100.12		
COMPLETED	27.03.2025	Co-Ordinates:	Easting	77° 35' 30" E		
TOTAL DEPTH	35.00		Northing	13° 02' 33" N		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
21.00	22.50	Completely Weathered Disintegrated Brownish Grey Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 3cm	R	R	R	29.4	
22.50	24.00	Completely Weathered Disintegrated Brownish Grey Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 3cm	R	R	R	27.8	
24.00	25.50	Completely Weathered Granitic Gneiss		V	Very Weak Rock	34°	0.12		-	-	-	-	8	0.00	0		NX		Grey	-		-	-	-	-	-	20.8	
25.50	27.00	Completely Weathered Granitic Gneiss		V	Very Weak Rock	42°	0.20		-	-	-	-	13	0.00	0		NX		Grey	-	-		-	-	-	-	20.0	
27.00	28.50	Highly Weathered Granitic Gneiss		IV	Very Weak Rock	38°	0.26		-	-	-	-	17	0.24	16		NX		Grey	-	-		-	-	-	-	18.7	
28.50	30.00	Highly Weathered Granitic Gneiss		IV	Very Weak Rock	25°	0.20		-	-	-	-	13	0.00	0		NX		Grey	-	-		-	-	-	-	17.2	
30.00	31.50	Moderately Weathered Granitic Gneiss		III	Weak Rock	29°	0.65				-	-	43	0.44	29		NX		Grey	-	-		-	-	-	-	15.0	
31.50	33.00	Slightly Weathered Granitic Gneiss		II	Medium Strong Rock	25°	0.69				-	-	46	0.32	21		NX		Grey	-	-		-	-	-	-	14.0	
33.00	34.50	Slightly Weathered Granitic Gneiss		II	Medium Strong Rock	31°	1.43						95	1.41	94		NX		Grey	-		-	-	-	-	-	13.9	
34.50	35.00	Slightly Weathered Granitic Gneiss		II	Medium Strong Rock	19°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	4.4	

SOIL		Disintegrated Rock		Granitic Gneseiss	

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GEOLOGICAL LOG OF BOREHOLE: BH - 04

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Race Course, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	24.03.2025	COLLAR ELEVATION:		100.12	
COMPLETED	04.04.2025	Co-Ordinates:	Easting	780039.119	
TOTAL DEPTH	43.00		Northing	1436422.875	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	3	6	8	14	100.0	
1.50	3.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	5	6	10	16	71.4	
3.00	4.50	Completely Weathered Disintegrated Brownish Grey Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	50/ 5cm	R	R	R	59.5	
4.50	6.00	Highly Weathered Granitic Gneiss		IV	Weak Rock	32°	0.59			-	-	-	39	0.59	39		NX	-	Grey	-		-	-	-	-	-	27.2	
6.00	7.50	Moderately Weathered Granitic Gneiss		III	Weak Rock	28°	1.22						81	1.22	81		NX	-	Grey	-		-	-	-	-	-	20.8	
7.50	9.00	Slightly Weathered Granitic Gneiss		II	Weak Rock	21°	1.37						91	1.37	91		NX	Δ GWL-8.3m	Grey		-	-	-	-	-	-	17.9	
9.00	10.50	Fresh, Granitic Gneiss		I	Weak Rock	25°	1.28						85	1.10	73		NX		Grey		-	-	-	-	-	-	15.6	
10.50	12.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	19°	1.37						91	1.37	91		NX		Grey		-	-	-	-	-	-	13.9	
12.00	13.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	15°	1.34						89	1.28	85		NX		Grey		-	-	-	-	-	-	10.4	
13.50	15.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	15°	1.37						91	1.37	91		NX		Grey		-	-	-	-	-	-	9.6	
15.00	16.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	12°	1.35						90	1.35	90		NX		Grey		-	-	-	-	-	-	9.6	
16.50	18.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	13°	1.37						91	1.37	91		NX		Grey		-	-	-	-	-	-	9.3	
18.00	19.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	16°	1.40						93	1.40	93		NX		Grey		-	-	-	-	-	-	9.1	
19.50	21.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	8°	1.43						95	1.43	95		NX		Grey		-	-	-	-	-	-	8.9	
21.00	22.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	11°	1.43						95	1.43	95		NX		Grey	-		-	-	-	-	-	8.8	
22.50	24.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	15°	1.50						100	1.50	100		NX		Grey	-	-		-	-	-	-	8.8	
24.00	25.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	13°	1.50						100	1.50	100		NX		Grey	-	-		-	-	-	-	8.6	

The Soft Rock encountered after 3.5m depth.
The Rockmass encountered is Hard Granitic Gneiss from 4.5m depth.
Ground Water Level Encountered at 8.3m depth.

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GEOLOGICAL LOG OF BOREHOLE: BH - 04

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Race Course, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	24.03.2025	COLLAR ELEVATION:		100.12	
COMPLETED	04.04.2025	Co-Ordinates:	Easting	780039.119	
TOTAL DEPTH	43.00		Northing	1436422.875	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
25.50	27.00	Fresh, Granitic Gneiss		I	Strong Rock	14°	1.50						100	1.50	100		NX		Grey	-	-		-	-	-	-	8.6	
27.00	28.50	Fresh, Granitic Gneiss		I	Strong Rock	16°	1.50						100	1.50	100		NX		Grey	-	-		-	-	-	-	8.5	
28.50	30.00	Fresh, Granitic Gneiss		I	Strong Rock	17°	1.50						100	1.50	100		NX		Grey	-		-	-	-	-	-	8.4	
30.00	31.50	Fresh, Granitic Gneiss		I	Strong Rock	6°	1.50						100	1.50	100		NX		Grey	-		-	-	-	-	-	8.4	
31.50	33.00	Fresh, Granitic Gneiss		I	Strong Rock	12°	1.50						100	1.50	100		NX		Grey	-		-	-	-	-	-	8.2	
33.00	34.50	Fresh, Granitic Gneiss		I	Strong Rock	10°	1.50						100	1.50	100		NX		Grey	-		-	-	-	-	-	7.9	
34.50	36.00	Fresh, Granitic Gneiss		I	Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8	
36.00	37.50	Fresh, Granitic Gneiss		I	Strong Rock	9°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8	
37.50	39.00	Fresh, Granitic Gneiss		I	Strong Rock	12°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8	
39.00	40.50	Fresh, Granitic Gneiss		I	Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.7	
40.50	42.00	Fresh, Granitic Gneiss		I	Strong Rock	8°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.7	
42.00	43.00	Fresh, Granitic Gneiss		I	Strong Rock	8°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	5.2	

SOIL		Disintegrated Rock		Granitic Gneseiss	

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GEOLOGICAL LOG OF BOREHOLE: BH - 06

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Bengaluru City University, Bengaluru	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	20.02.2025	COLLAR ELEVATION:	100.12		
COMPLETED	04.03.2025	Co-Ordinates: Easting	780019.095		
TOTAL DEPTH	62.00	Northing	1435873.311		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	17	36	50/ 8cm	R	83.3	
1.50	3.00	Completely Weathered Disintegrated Greyish Brown Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	50/ 4cm	R	R	R	62.5	
3.00	4.50	Slightly Weathered Granitic Gneiss		II	Medium Strong Rock	42°	1.25						83	1.25	83		NX	-	Grey		-	-	-	-	-	-	15.6	
4.50	6.00	Slightly Weathered Granitic Gneiss		II	Medium Strong Rock	37°	0.98					-	65	0.98	65		NX	Δ GWL-4.5m	Grey		-	-	-	-	-	-	14.7	
6.00	7.50	Slightly Weathered, Granitic Gneiss		II	Medium Strong Rock	24°	1.08					-	72	1.01	67		NX		Grey		-	-	-	-	-	-	16.7	
7.50	9.00	Moderately Weathered, Granitic Gneiss		III	Medium Strong Rock	31°	0.80				-	-	53	0.75	50		NX		Grey	-		-	-	-	-	-	15.6	
9.00	10.50	Moderately Weathered, Granitic Gneiss		III	Medium Strong Rock	28°	0.50			-	-	-	33	0.50	33		NX		Grey	-		-	-	-	-	-	20.8	
10.50	12.00	Moderately Weathered, Granitic Gneiss		III	Medium Strong Rock	29°	0.71				-	-	47	0.50	33		NX		Grey	-		-	-	-	-	-	17.9	
12.00	13.50	Moderately Weathered, Granitic Gneiss		III	Medium Strong Rock	31°	0.68				-	-	45	0.62	41		NX		Grey	-		-	-	-	-	-	17.2	
13.50	15.00	Moderately Weathered, Granitic Gneiss		III	Medium Strong Rock	30°	0.62				-	-	41	0.62	41		NX		Grey	-		-	-	-	-	-	17.9	
15.00	16.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	17°	1.20					-	80	1.10	73		NX		Grey		-	-	-	-	-	-	13.9	
16.50	18.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	15°	1.10					-	73	1.10	73		NX		Grey		-	-	-	-	-	-	14.7	
18.00	19.50	Fresh, Granitic Gneiss		I	Strong Rock	16°	1.37						91	1.37	91		NX		Grey		-	-	-	-	-	-	13.2	
19.50	21.00	Fresh, Granitic Gneiss		I	Strong Rock	12°	1.31						87	1.31	87		NX		Grey		-	-	-	-	-	-	12.8	
21.00	22.50	Fresh, Granitic Gneiss		I	Strong Rock	14°	1.37						91	1.37	91		NX		Grey	-		-	-	-	-	-	12.5	
22.50	24.00	Fresh, Granitic Gneiss		I	Strong Rock	20°	1.46						97	1.46	97		NX		Grey	-	-		-	-	-	-	11.9	

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GEOLOGICAL LOG OF BOREHOLE: BH - 06

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Bengaluru City University, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT		
STARTED	20.02.2025	COLLAR ELEVATION:		100.12		
COMPLETED	04.03.2025	Co-Ordinates:	Easting	780019.095		
TOTAL DEPTH	62.00		Northing	1435873.311		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
24.00	25.50	Fresh, Granitic Gneiss		I	Strong Rock	17°	1.43						95	1.43	95		NX		Grey	-	-		-	-	-	-	11.4	
25.50	27.00	Fresh, Granitic Gneiss		I	Strong Rock	23°	1.44						96	1.44	96		NX		Grey	-	-		-	-	-	-	10.4	
27.00	28.50	Fresh, Granitic Gneiss		I	Strong Rock	16°	1.44						96	1.44	96		NX		Grey	-	-		-	-	-	-	9.6	
28.50	30.00	Fresh, Granitic Gneiss		I	Strong Rock	28°	1.46						97	1.46	97		NX		Grey	-		-	-	-	-	-	10.4	
30.00	31.50	Fresh, Granitic Gneiss		I	Strong Rock	12°	1.46						97	1.46	97	NX	NX		Grey	-		-	-	-	-	-	10.0	The Soft Rock encountered after 2.0m depth. The Rockmass encountered is Hard Granitic Gneiss from 3.0m depth. Ground Water Level Encountered at 4.5m depth.
31.50	33.00	Fresh, Granitic Gneiss		I	Strong Rock	8°	1.47						98	1.47	98		NX		Grey	-		-	-	-	-	-	9.3	
33.00	34.50	Fresh, Granitic Gneiss		I	Strong Rock	9°	1.47						98	1.47	98		NX		Grey	-		-	-	-	-	-	8.9	
34.50	36.00	Fresh, Granitic Gneiss		I	Strong Rock	11°	1.47						98	1.47	98		NX		Grey		-	-	-	-	-	-	8.6	
36.00	37.50	Fresh, Granitic Gneiss		I	Strong Rock	10°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.3	
37.50	39.00	Fresh, Granitic Gneiss		I	Strong Rock	14°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.1	
39.00	40.50	Fresh, Granitic Gneiss		I	Strong Rock	13°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	8.1	
40.50	42.00	Fresh, Granitic Gneiss		I	Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.8	
42.00	43.50	Fresh, Granitic Gneiss		I	Strong Rock	14°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.9	
43.50	45.00	Fresh, Granitic Gneiss		I	Strong Rock	16°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.7	
45.00	46.50	Fresh, Granitic Gneiss		I	Strong Rock	14°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.4	
46.50	48.00	Fresh, Granitic Gneiss		I	Strong Rock	9°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	

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GEOLOGICAL LOG OF BOREHOLE: BH - 06

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Bengaluru City University, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT		
STARTED	20.02.2025	COLLAR ELEVATION:		100.12		
COMPLETED	04.03.2025	Co-Ordinates:	Easting	780019.095		
TOTAL DEPTH	62.00		Northing	1435873.311		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT					Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)	Penetration Rate (mm/min)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
48.00	49.50	Fresh, Granitic Gneiss		I	Strong Rock	5°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
49.50	51.00	Fresh, Granitic Gneiss		I	Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
51.00	52.50	Fresh, Granitic Gneiss		I	Strong Rock	8°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.4	
52.50	54.00	Fresh, Granitic Gneiss		I	Strong Rock	19°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.2	
54.00	55.50	Fresh, Granitic Gneiss		I	Strong Rock	19°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
55.50	57.00	Fresh, Granitic Gneiss		I	Strong Rock	14°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
57.00	58.50	Fresh, Granitic Gneiss		I	Strong Rock	13°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
58.50	60.00	Fresh, Granitic Gneiss		I	Strong Rock	16°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	6.9	
60.00	61.50	Fresh, Granitic Gneiss		I	Strong Rock	12°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	7.1	
61.50	62.00	Fresh, Granitic Gneiss		I	Strong Rock	7°	1.50						100	1.50	100		NX		Grey		-	-	-	-	-	-	4.9	

SOIL		Disintegrated Rock		Granitic Gneseiss

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GEOLOGICAL LOG OF BOREHOLE: BH - 07

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Banappa Park, Bengaluru.	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	07.03.2025	COLLAR ELEVATION:		100.12	
COMPLETED	09.03.2025	Co-Ordinates:	Easting	1435233.735	
TOTAL DEPTH	24.00		Northing	780421.946	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	5	6	7	13	80.6	
1.50	3.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	6	9	11	20	78.1	
3.00	4.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	9	11	15	26	73.5	
4.50	6.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	9	13	17	30	65.8	
6.00	7.50	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	12	14	18	32	71.4	
7.50	9.00	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	13	17	26	43	59.5	
9.00	10.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	21	31	42	73	54.3	
10.50	12.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	33	50/ 13cm	R	R	50.0	
12.00	13.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--	NX	NX	-	Grey		-	-	50/ 14cm	R	R	R	50.0	The Soft Rock encountered after 17.0m depth. Ground Water Level Encountered at 15.0m depth.
13.50	15.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	50/ 12cm	R	R	R	49.0	
15.00	16.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	Δ GWL-15.0m	Grey		-	-	50/ 10cm	R	R	R	48.1	
16.50	18.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 4cm	R	R	R	29.4	
18.00	19.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 3cm	R	R	R	26.3	

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GEOLOGICAL LOG OF BOREHOLE: BH - 07

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Banappa Park, Bengaluru.	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90^{o}	DRILLING BIT:		DIAMOND CORE BIT		
STARTED	07.03.2025	COLLAR ELEVATION:		100.12		
COMPLETED	09.03.2025	Co-Ordinates:	Easting	1435233.735		
TOTAL DEPTH	24.00		Northing	780421.946		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	**15cm**	**30cm**	**45cm**	**"N"**		
19.50	21.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 3cm	R	R	**R**	23.8	
21.00	22.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 3cm	R	R	**R**	22.7	
22.50	24.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 2cm	R	R	**R**	20.8	

SOIL	Disintegrated Rock		Granitic Gneseiss	

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GEOLOGICAL LOG OF BOREHOLE: BH - 10

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Lal Bagh, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT		
STARTED	24.02.2025	COLLAR ELEVATION:		100.12		
COMPLETED	05.03.2025	Co-Ordinates:	Easting	780923.86		
TOTAL DEPTH	42.00		Northing	1432660.916		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT					Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)	Penetration Rate (mm/min)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Moderately Weathered Granitic Gneiss		III	Medium Strong Rock	14°	0.68				-	-	45	0.33	22		NX	-	Grey		-	-	-	-	-	-	20.8	
1.50	3.00	Slightly Weathered Granitic Gneiss		II	Medium Strong Rock	24°	1.10					-	73	1.04	69		NX	-	Grey		-	-	-	-	-	-	20.8	
3.00	4.50	Slightly Weathered Granitic Gneiss		II	Medium Strong Rock	21°	0.95					-	63	0.95	63		NX	-	Grey		-	-	-	-	-	-	16.7	
4.50	6.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	19°	1.19					-	79	1.19	79		NX	-	Grey		-	-	-	-	-	-	17.9	
6.00	7.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	16°	1.07					-	71	1.07	71		NX	-	Grey		-	-	-	-	-	-	14.7	
7.50	9.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	13°	0.98					-	65	0.98	65		NX	-	Grey		-	-	-	-	-	-	13.9	
9.00	10.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	14°	1.28						85	1.28	85		NX	-	Grey		-	-	-	-	-	-	13.2	
10.50	12.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	14°	1.28						85	1.28	85		NX	-	Grey		-	-	-	-	-	-	12.5	
12.00	13.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	10°	1.37						91	1.31	87		NX	-	Grey		-	-	-	-	-	-	11.9	
13.50	15.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	11°	1.10					-	73	1.10	73		NX	-	Grey		-	-	-	-	-	-	11.4	
15.00	16.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	9°	1.07					-	71	1.07	71		NX	-	Grey		-	-	-	-	-	-	11.9	
16.50	18.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	14°	0.80				-	-	53	0.80	53		NX	-	Grey		-	-	-	-	-	-	12.8	
18.00	19.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	13°	0.72				-	-	48	0.72	48		NX	-	Grey		-	-	-	-	-	-	12.5	
19.50	21.00	Fresh, Granitic Gneiss		I	Strong Rock	8°	0.98					-	65	0.92	61		NX	-	Grey		-	-	-	-	-	-	12.2	
21.00	22.50	Fresh, Granitic Gneiss		I	Strong Rock	5°	0.93					-	62	0.92	61		NX	-	Grey	-		-	-	-	-	-	11.9	
22.50	24.00	Fresh, Granitic Gneiss		I	Strong Rock	8°	0.87				-	-	58	0.77	51		NX	-	Grey	-	-		-	-	-	-	10.4	

The Rockmass encountered is Hard Granitic Gneiss from Surface Level.
Ground Water not Encountered.

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GEOLOGICAL LOG OF BOREHOLE: BH - 10

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Lal Bagh, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	24.02.2025	COLLAR ELEVATION:		100.12	
COMPLETED	05.03.2025	Co-Ordinates:	Easting	780923.86	
TOTAL DEPTH	42.00		Northing	1432660.916	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
24.00	25.50	Fresh, Granitic Gneiss		I	Strong Rock	12°	0.93					-	62	0.93	62		NX	-	Grey	-	-		-	-	-	-	9.6	
25.50	27.00	Fresh, Granitic Gneiss		I	Strong Rock	14°	1.29						86	1.29	86		NX	-	Grey	-	-		-	-	-	-	9.8	
27.00	28.50	Fresh, Granitic Gneiss		I	Strong Rock	14°	1.49						99	1.49	99		NX	-	Grey	-	-		-	-	-	-	9.6	
28.50	30.00	Fresh, Granitic Gneiss		I	Strong Rock	14°	1.46						97	1.46	97		NX	-	Grey	-		-	-	-	-	-	9.3	
30.00	31.50	Fresh, Granitic Gneiss		I	Strong Rock	13°	1.49						99	1.49	99		NX	-	Grey	-		-	-	-	-	-	9.1	
31.50	33.00	Fresh, Granitic Gneiss		I	Strong Rock	7°	1.49						99	1.49	99		NX	-	Grey	-		-	-	-	-	-	8.9	
33.00	34.50	Fresh, Granitic Gneiss		I	Strong Rock	8°	1.38						92	1.25	83		NX	-	Grey	-		-	-	-	-	-	8.3	
34.50	36.00	Fresh, Granitic Gneiss		I	Strong Rock	14°	1.47						98	1.47	98		NX	-	Grey		-	-	-	-	-	-	8.1	
36.00	37.50	Fresh, Granitic Gneiss		I	Strong Rock	16°	1.49						99	1.49	99		NX	-	Grey		-	-	-	-	-	-	7.6	
37.50	39.00	Fresh, Granitic Gneiss		I	Strong Rock	19°	1.50						100	1.50	100		NX	-	Grey		-	-	-	-	-	-	7.4	
39.00	40.50	Fresh, Granitic Gneiss		I	Strong Rock	17°	1.50						100	1.50	100		NX	-	Grey		-	-	-	-	-	-	7.6	
40.50	42.00	Fresh, Granitic Gneiss		I	Strong Rock	11°	1.50						100	1.50	100		NX	-	Grey		-	-	-	-	-	-	7.4	

SOIL		Disintegrated Rock		Granitic Gneseiss	

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GEOLOGICAL LOG OF BOREHOLE: BH - 12

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Opp Bethel Church, Hebbal, Bengaluru.	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	29.03.2025	COLLAR ELEVATION:		100.12	
COMPLETED	31.03.2025	Co-Ordinates:	Easting	77° 35' 52" E	
TOTAL DEPTH	35.00		Northing	13° 02' 33" N	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Soil		VI	Loose	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	2	3	3	**6**	131.6	
1.50	3.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	5	6	11	**17**	100.0	
3.00	4.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	5	6	8	**14**	71.4	
4.50	6.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	8	10	12	**22**	75.8	
6.00	7.50	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	7	11	12	**23**	67.6	
7.50	9.00	Soil		VI	Medium Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	8	12	14	**26**	64.1	
9.00	10.50	Soil		VI	Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	16	20	26	**46**	62.5	
10.50	12.00	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	27	50/ 12cm	R	**R**	35.7	
12.00	13.50	Soil		VI	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	50/ 5cm	R	R	**R**	35.7	
13.50	15.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	-	Grey		-	-	50/ 5cm	R	R	**R**	33.3	
15.00	16.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX	Δ GWL-16.0m	Grey		-	-	50/ 4cm	R	R	**R**	31.3	
16.50	18.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 4cm	R	R	**R**	29.4	
18.00	19.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 4cm	R	R	**R**	27.8	
19.50	21.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--	NX	NX		Grey		-	-	50/ 3cm	R	R	**R**	26.3	The Soft Rock encountered after 12.5m depth. The Rockmass encountered is Granitic Gneiss from 34.5m depth. Ground Water Level Encountered at 16.0m depth.

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GEOLOGICAL LOG OF BOREHOLE: BH - 12

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Opp Bethel Church, Hebbal, Bengaluru.	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	29.03.2025	COLLAR ELEVATION:	100.12		
COMPLETED	31.03.2025	Co-Ordinates: Easting	77° 35' 52" E		
TOTAL DEPTH	35.00	Northing	13° 02' 33" N		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT					Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)	Penetration Rate (mm/min)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
21.00	22.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	--		NX		Grey		-	-	50/ 3cm	R	R	R	26.3	
22.50	24.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 2cm	R	R	R	26.0	
24.00	25.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 2cm	R	R	R	25.5	
25.50	27.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 2cm	R	R	R	26.3	
27.00	28.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 2cm	R	R	R	26.0	
28.50	30.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 2cm	R	R	R	25.8	
30.00	31.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 2cm	R	R	R	26.3	
31.50	33.00	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 2cm	R	R	R	26.3	
33.00	34.50	Completely Weathered Disintegrated Brownish Rock (Washed Sample)		V	Very Dense	-	-	-	-	-	-	-	-	-	-		NX		Grey		-	-	50/ 2cm	R	R	R	26.3	
34.50	35.00	Highly Weathered Granitic Gneiss		IV	Very Weak Rock	46°	0.26		-	-	-	-	17	0.00	0		NX		Grey	-		-	-	-	-	-	-	26.9	

SOIL		Disintegrated Rock	Granitic Gneseiss

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GEOLOGICAL LOG OF BOREHOLE: BH - 18

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Atria University, Bengaluru	TYPE OF CORE BARREL:	DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed)	100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:	DIAMOND CORE BIT		
STARTED	09.03.2025	COLLAR ELEVATION:	100.12		
COMPLETED	20.03.2025	Co-Ordinates: Easting	77° 35'32.1" E		
TOTAL DEPTH	40.00	Northing	13° 01' 59.8" N		

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT				Penetration Rate (mm/min)	Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
0.00	1.50	Slightly Weathered Granitic Gneiss		II	Weak Rock	23°	0.66				-	-	44	0.00	0		NX	-	Grey		-	-	-	-	-	-	14.7	
1.50	3.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	19°	1.07					-	71	1.07	71		NX	-	Grey		-	-	-	-	-	-	13.5	
3.00	4.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	27°	0.98					-	65	0.98	65		NX	-	Grey		-	-	-	-	-	-	12.8	
4.50	6.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	20°	1.11					-	74	1.11	74		NX	-	Grey		-	-	-	-	-	-	11.9	
6.00	7.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	19°	1.31						87	1.16	77		NX	-	Grey		-	-	-	-	-	-	11.4	
7.50	9.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	17°	1.40						93	1.29	86		NX	Δ GWL-7.5m	Grey		-	-	-	-	-	-	10.4	
9.00	10.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	26°	1.49						99	1.49	99		NX		Grey		-	-	-	-	-	-	9.6	
10.50	12.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	23°	1.25						83	1.25	83		NX		Grey		-	-	-	-	-	-	10.0	
12.00	13.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	23°	1.37						91	1.37	91		NX		Grey		-	-	-	-	-	-	9.3	
13.50	15.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	14°	1.37						91	1.37	91		NX		Grey		-	-	-	-	-	-	8.6	
15.00	16.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	21°	1.35						90	1.35	90		NX		Grey		-	-	-	-	-	-	8.1	
16.50	18.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	28°	1.43						95	1.43	95		NX		Grey		-	-	-	-	-	-	8.1	
18.00	19.50	Fresh, Granitic Gneiss		I	Medium Strong Rock	15°	1.40						93	1.40	93		NX		Grey		-	-	-	-	-	-	7.8	
19.50	21.00	Fresh, Granitic Gneiss		I	Medium Strong Rock	16°	1.47						98	1.47	98		NX		Grey		-	-	-	-	-	-	7.6	The Rockmass encountered is Hard Granitic Gneiss from Surface Level. Ground Water Encountered at 7.5m.
21.00	22.50	Fresh, Granitic Gneiss		I	Strong Rock	12°	1.37						91	1.37	91		NX		Grey		-	-	-	-	-	-	7.4	

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GEOLOGICAL LOG OF BOREHOLE: BH - 18

PROJECT: Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction

LOCATION	Atria University, Bengaluru	TYPE OF CORE BARREL:		DOUBLE TUBE CORE BARREL	GROUND ELEVATION (Assumed) 100
ANGLE WITH HORIZONTAL	90°	DRILLING BIT:		DIAMOND CORE BIT	
STARTED	09.03.2025	COLLAR ELEVATION:		100.12	
COMPLETED	20.03.2025	Co-Ordinates:	Easting	77° 35'32.1" E	
TOTAL DEPTH	40.00		Northing	13° 01' 59.8" N	

Depth (m)		Lithology Description	Graphic Log	Weathering Grade (As per ISRM,1981)	Structural Conditions		Core Recovery							RQD		Type of Bit	Size of the hole	Depth of Water Table (m)	Colour of Return Water	Drill Water Loss			SPT					Special observations and interpretations
							TCR Length (m)	0-20	20-40	40-60	60-80	80-100	TCR (%)	RQD (Length in m of core pieces>=10cm)	RQD %					Nill	Partial	Full	BLOWS/15CM)			SPT N Value (Blows/cm)	Penetration Rate (mm/min)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
From	To				Strength	Joint Angle																	15cm	30cm	45cm	"N"		
22.50	24.00	Fresh, Granitic Gneiss		I	Strong Rock	7°	1.49						99	1.49	99		NX		Grey	-	-		-	-	-	-	7.8	
24.00	25.50	Fresh, Granitic Gneiss		I	Strong Rock	14°	1.50						100	1.50	100		NX		Grey	-	-		-	-	-	-	7.6	
25.50	27.00	Fresh, Granitic Gneiss		I	Strong Rock	10°	1.50						100	1.50	100		NX		Grey	-	-		-	-	-	-	7.4	
27.00	28.50	Fresh, Granitic Gneiss		I	Strong Rock	7°	1.50						100	1.50	100		NX		Grey	-	-		-	-	-	-	7.8	
28.50	30.00	Fresh, Granitic Gneiss		I	Strong Rock	13°	1.50						100	1.50	100		NX		Grey	-	-		-	-	-	-	8.1	
30.00	31.50	Fresh, Granitic Gneiss		I	Strong Rock	14°	1.50						100	1.50	100		NX		Grey	-	-		-	-	-	-	7.8	
31.50	33.00	Fresh, Granitic Gneiss		I	Strong Rock	20°	1.50						100	1.50	100		NX		Grey	-	-		-	-	-	-	8.3	
33.00	34.50	Fresh, Granitic Gneiss		I	Strong Rock	12°	1.50						100	1.50	100		NX		Grey	-	-		-	-	-	-	8.1	
34.50	36.00	Fresh, Granitic Gneiss		I	Strong Rock	13°	1.50						100	1.50	100		NX		Grey		-		-	-	-	-	7.8	
36.00	37.50	Fresh, Granitic Gneiss		I	Very Strong Rock	17°	1.50						100	1.50	100		NX		Grey		-		-	-	-	-	8.1	
37.50	39.00	Fresh, Granitic Gneiss		I	Very Strong Rock	15°	1.50						100	1.50	100		NX		Grey		-		-	-	-	-	7.8	
39.00	40.00	Fresh, Granitic Gneiss		I	Very Strong Rock	5°	1.50						100	1.50	100		NX		Grey		-		-	-	-	-	5.2	

SOIL		Disintegrated Rock		Granitic Gneseiss	

APPENDIX-B

Laboratory Test Results of Soil/Rock Samples

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Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

PHYSICAL PROPERTIES OF SOIL as per IS : 2720

Borehole No	Depth (m)	Grain size analysis					Atterberg Limits			Description of Soil	Insitu moisture content	Bulk Density	Specific Gravity	Free Swell Index	Shear Strength Parameters	
		Gravel	Sand			Silt & Clay	Liquid Limts	Plastic Limits	Plasticity Index						Cohesive Strength (c)	Angle of Internal Friction (φ)
			e	Medium	Fine											
		%	%	%	%	%	%	%	%		%	gm/cc		%	(kg/cm^2)	(Deg)
BH-01	4.5	0.34	0.19	16.97	28.47	**54**	48	23	25	Sandy Lean Clay	3.08	1.78	2.58	25	0.3	10
BH-01	6.0	0.39	0.21	15.37	26.91	**57**	48	23	25	Sandy Lean Clay	13.16	1.8	2.59	20	0.4	7
BH-01	7.5	0.25	0.27	12.07	27.69	**60**	46	23	23	Sandy Lean Clay	14.20	1.81	2.59	20	0.45	7
BH-01	9.0	0.23	0.97	18.68	26.58	**54**	35	27	8	Sandy SILT	14.33	1.82	2.62	10	0	21
BH-01	10.5	0.72	0.67	16.54	24	**58**	36	25	11	Sandy SILT	15.02	1.83	2.61	0	0	23
BH-01	12.0	0	0.23	15.49	26.09	**58**	36	25	11	Sandy SILT	14.88	1.85	2.63	0	0	25
BH-02	1.5	3.33	0.82	6.41	14.17	**75**	49	24	25	Lean Clay with Sand	5.24	1.75	2.61	25	0.2	5
BH-02	3.0	2.91	1.18	8.91	16.72	**70**	61	26	35	Fat Clay with Sand	3.99	1.78	2.60	30	0.32	0
BH-02	4.5	0.23	0.82	10.56	22.21	**66**	34	27	7	Sandy SILT	4.68	1.80	2.63	10	0	20
BH-02	7.5	0	0	10.52	66.03	**23**	32	26	6	Silty SAND	5.24	1.82	2.65	10	0	23
BH-02	9.0	0	0	8.17	58.13	**34**	33	25	8	Silty SAND	5.30	1.84	2.65	0	0	25

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No	Depth (m)	Grain size analysis					Atterberg Limits			Description of Soil	Insitu moisture content	Bulk Density	Specific Gravity	Free Swell Index	Shear Strength Parameters	
		Gravel	Sand			Silt & Clay	Liquid Limts	Plastic Limits	Plasticity Index						Cohesive Strength (c)	Angle of Internal Friction (φ)
			e	Medium	Fine											
		%	%	%	%	%	%	%	%		%	gm/cc		%	(kg/cm^2)	(Deg)
BH-02	10.5	6.72	8.74	60.03	8.46	**16**	31	25	6	Silty SAND	6.89	1.87	2.64	0	0	26
BH-02	12.0	1.9	3.69	61.21	14.8	**18**	32	26	6	Silty SAND	7.25	1.91	2.65	0	0	26
BH-02	13.5	5.62	1.17	37.87	23.91	**31**	29	NP	NP	Silty SAND	8.06	1.99	2.65	0	0	27
BH-02	15.0	7.31	2.75	36.83	18.72	**34**	30	NP	NP	Silty SAND	11.25	2.04	2.65	0	0	28
BH-02	16.5	0.489	0.55	23.98	33.99	**41**	29	NP	NP	Silty SAND	14.11	2.10	2.66	0	0	30
BH-04	1.5	1.24	2.44	25.87	29.66	**41**	34	28	6	Silty SAND	1.98	1.78	2.64	10	0	23
BH-04	3.0	0.98	3.05	24.57	28.31	**43**	34	28	6	Silty SAND	3.51	1.82	2.63	10	0	25
BH-06	1.5	10.24	1.47	29.55	30.45	**28**	31	NP	NP	Silty SAND	2.28	2.02	2.65	0	0	29
BH-07	1.5	0.69	1.46	20.3	38.26	**39**	36	25	11	Silty SAND	4.20	1.75	2.65	15	0.1	17
BH-07	3.0	5.26	4.28	20.38	38.33	**32**	36	25	11	Silty SAND	4.16	1.81	2.65	15	0.1	21
BH-07	4.5	0.22	0.63	28.67	30.82	**40**	32	NP	NP	Silty SAND	5.29	1.83	2.65	0	0	24
BH-07	6.0	0	0	30.69	34.31	**35**	29	NP	NP	Silty SAND	5.26	1.88	2.63	0	0	26

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Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No	Depth (m)	Grain size analysis					Atterberg Limits			Description of Soil	Insitu moisture content	Bulk Density	Specific Gravity	Free Swell Index	Shear Strength Parameters	
		Gravel	Sand			Silt & Clay	Liquid Limts	Plastic Limits	Plasticity Index						Cohesive Strength (c)	Angle of Internal Friction (φ)
			e	Medium	Fine											
		%	%	%	%	%	%	%	%		%	gm/cc		%	(kg/cm^2)	(Deg)
BH-07	7.5	1.33	2.35	28.99	26.9	**40**	29	NP	NP	Silty SAND	6.14	1.92	2.63	0	0	26
BH-07	10.5	14.01	8.48	27.12	14.1	**36**	34	NP	NP	Silty SAND	7.23	2.00	2.64	0	0	28
BH-07	15.0	12.44	5.08	24.11	19.64	**39**	34	NP	NP	Silty SAND	11.24	2.06	2.63	0	0	29
BH-07	16.5	12.96	4.15	25.5	21.7	**36**	28	NP	NP	Silty SAND	13.99	2.11	2.65	0	0	30
BH-12	1.5	4.17	1.98	17.25	21.06	**56**	36	28	8	Sandy SILT	4.55	1.70	2.65	0	0	17
BH-12	3.0	0.29	1.02	11	19.45	**68**	48	24	24	Sandy Lean Clay	7.85	1.75	2.61	10	0.4	0
BH-12	4.5	2.75	1.52	9.77	16.52	**69**	49	23	26	Sandy Lean Clay	8.09	1.80	2.61	15	0.54	0
BH-12	6.0	3.9	2.05	11.44	15.37	**67**	48	23	25	Sandy Lean Clay	7.11	1.82	2.61	15	0.6	0
BH-12	7.5	1.2	2.55	19.52	21.08	**56**	33	27	6	Sandy SILT	4.20	1.85	2.63	10	0	25
BH-12	9.0	0.82	3.66	24.89	28.71	**42**	34	27	7	Silty SAND	4.66	1.87	2.63	0	0	26
BH-12	10.5	1.74	2.28	23.3	27.55	**45**	33	28	5	Silty SAND	5.24	1.93	2.64	0	0	27
BH-12	12.0	0	5.5	29.8	31.06	**34**	33	28	5	Silty SAND	7.09	2.02	2.64	0	0	28

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

PHYSICAL PROPERTIES OF ROCK CORES (UCC) as per IS :9143, 13030,1124

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-01 28.5m-30m	54.0	2290.22	80	490	21	9.17	**8.65**	2.67	0.3	0.8	-	-
BH-01 30m-31.5m	54.0	2290.22	90	553	26	11.35	**10.94**	2.68	0.3	0.8	-	-
BH-01 31.5m-33.0m	54.0	2290.22	110	680	25	10.92	**10.96**	2.70	0.2	0.9	-	-
BH-01 33.0m-34.5m	54.0	2290.22	110	685	35	15.28	**15.34**	2.72	0.2	0.6	-	-
BH-01 34.5m-36.0m	54.0	2290.22	111	696	48	20.96	**21.09**	2.74	0.0	0.0	-	-
BH-01 36.0m-37.5m	54.0	2290.22	110	687	47	20.52	**20.60**	2.73	0.0	0.0	-	-
BH-01 37.5m-39.0m	54.0	2290.22	109	685	65	28.38	**28.44**	2.74	0.0	0.1	-	-
BH-01 39.0m-40.5m	54.0	2290.22	110	686	72	31.44	**31.56**	2.72	0.0	0.0	-	-
BH-01 40.5m-42.0m	54.0	2290.22	110	692	75	32.75	**32.88**	2.75	0.0	0.0	31245	0.23
BH-01 42.0m-43.0m	54.0	2290.22	110	698	69	30.13	**30.25**	2.77	0.0	0.0	31089	0.25

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-02 30.0m-31.5m	54.0	2290.22	104	642	34	14.85	**14.73**	2.70	0.0	0.4	-	-
BH-02 31.5m-33.0m	54.0	2290.22	110	679	58	25.33	**25.43**	2.70	0.0	0.3	-	-
BH-02 33.0-34.5m	54.0	2290.22	110	684	63	27.51	**27.62**	2.72	0.0	0.0	29500	0.19
BH-02 34.5m-35.0m	54.0	2290.22	110	682	65	28.38	**28.50**	2.71	0.0	0.0	30756	0.21
BH-04 4.5m-6.0m	54.0	2290.22	110	675	28	12.23	**12.28**	2.68	0.1	0.7	-	-
BH-04 6.0m-7.5m	54.0	2290.22	110	679	41	17.90	**17.97**	2.70	0.2	0.8	-	-
BH-04 7.5m-9.0m	54.0	2290.22	110	685	48	20.96	**21.04**	2.72	0.2	0.6	-	-
BH-04 9.0m-10.5m	54.0	2290.22	110	684	55	24.02	**24.11**	2.72	0.0	0.0	-	-
BH-04 10.5m-12.0m	54.0	2290.22	111	682	79	34.49	**34.70**	2.68	0.0	0.0	-	-
BH-04 12.0m-13.5m	54.0	2290.22	112	689	84	36.68	**36.97**	2.69	0.0	0.0	-	-
BH-04 13.5m-15.0m	54.0	2290.22	110	690	83	36.24	**36.39**	2.74	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-04 15.0m-16.5m	54.0	2290.22	110	692	79	34.49	**34.63**	2.75	0.0	0.0	-	-
BH-04 16.5m-18.0m	54.0	2290.22	110	692	85	37.11	**37.26**	2.75	0.0	0.0	-	-
BH-04 18.0m-19.5m	54.0	2290.22	110	691	72	31.44	**31.56**	2.74	0.0	0.0	-	-
BH-04 19.5m-21.0m	54.0	2290.22	110	695	68	29.69	**29.81**	2.76	0.0	0.0	-	-
BH-04 21.0m-22.5m	54.0	2290.22	110	692	91	39.73	**39.89**	2.75	0.0	0.0	-	-
BH-04 22.5m-24.0m	54.0	2290.22	110	699	89	38.86	**39.02**	2.77	0.0	0.0	-	-
BH-04 24.0m-25.5m	54.0	2290.22	110	701	102	44.54	**44.72**	2.78	0.0	0.0	-	-
BH-04 25.5m-27.0m	54.0	2290.22	110	701	119	51.96	**52.17**	2.78	0.0	0.0	-	-
BH-04 25.5m-27.0m	54.0	2290.22	112	701	132	57.64	**58.10**	2.73	0.0	0.0	-	-
BH-04 27.0m-28.5m	54.0	2290.22	110	702	130	56.76	**56.99**	2.79	0.0	0.0	-	-
BH-04 28.5m-30.0m	54.0	2290.22	110	700	124	54.14	**54.36**	2.78	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-04 30.0m-31.5m	54.0	2290.22	110	699	145	63.31	**63.57**	2.77	0.0	0.0	-	-
BH-04 31.5m-33.0m	54.0	2290.22	110	701	153	66.81	**67.07**	2.78	0.0	0.0	-	-
BH-04 33.0m-34.5m	54.0	2290.22	110	699	150	65.50	**65.76**	2.77	0.0	0.0	-	-
BH-04 34.5m-36.0m	54.0	2290.22	110	695	149	65.06	**65.32**	2.76	0.0	0.0	-	-
BH-04 36.0m-37.5m	54.0	2290.22	110	700	189	82.52	**82.86**	2.78	0.0	0.0	-	-
BH-04 37.5m-39.0m	54.0	2290.22	110	701	190	82.96	**83.30**	2.78	0.0	0.0	-	-
BH-04 39.0m-40.5m	54.0	2290.22	110	698	161	70.30	**70.58**	2.77	0.0	0.0	57698	0.18
BH-04 40.5m-42.0m	54.0	2290.22	110	701	210	91.69	**92.06**	2.78	0.0	0.0	63852	0.20
BH-04 42.0m-43.0m	54.0	2290.22	110	703	204	89.07	**89.43**	2.79	0.0	0.0	62455	0.19
BH-06 3.0m-4.5m	54.0	2290.22	110	684	58	25.33	**25.43**	2.72	0.1	0.7	-	-
BH-06 4.5m-6.0m	54.0	2290.22	110	685	64	27.94	**28.06**	2.72	0.0	0.4	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-06 6.0m-7.5m	54.0	2290.22	110	681	59	25.76	**25.87**	2.70	0.1	0.3	-	-
BH-06 7.5m-9.0m	54.0	2290.22	112	683	72	31.44	**31.69**	2.66	0.0	0.0	-	-
BH-06 9.0m-10.5m	54.0	2290.22	110	683	69	30.13	**30.25**	2.71	0.0	0.0	-	-
BH-06 10.5m-12.0m	54.0	2290.22	110	691	78	34.06	**34.19**	2.74	0.0	0.0	-	-
BH-06 12.0m-13.5m	54.0	2290.22	108	688	89	38.86	**38.86**	2.78	0.0	0.0	-	-
BH-06 13.5m-15.0m	54.0	2290.22	110	691	95	41.48	**41.65**	2.74	0.0	0.0	-	-
BH-06 15.0m-16.5m	54.0	2290.22	110	692	102	44.54	**44.72**	2.75	0.0	0.0	-	-
BH-06 16.5m-18.0m	54.0	2290.22	110	690	105	45.85	**46.03**	2.74	0.0	0.0	-	-
BH-06 18.0m-19.5m	54.0	2290.22	109	685	117	51.09	**51.19**	2.74	0.0	0.0	-	-
BH-06 19.5m-21.0m	54.0	2290.22	110	690	123	53.71	**53.92**	2.74	0.0	0.0	-	-
BH-06 21.0m-22.5m	54.0	2290.22	110	688	146	63.75	**64.01**	2.73	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-06 22.5m-24.0m	54.0	2290.22	111	691	144	62.88	**63.26**	2.72	0.0	0.0	-	-
BH-06 24.0m-25.5m	54.0	2290.22	112	694	139	60.69	**61.18**	2.71	0.0	0.0	-	-
BH-06 25.5m-27.0m	54.0	2290.22	113	701	150	65.50	**66.15**	2.71	0.0	0.0	-	-
BH-06 27.0m-28.5m	54.0	2290.22	110	685	178	77.72	**78.03**	2.72	0.0	0.0	-	-
BH-06 28.5m-30.0m	54.0	2290.22	110	695	180	78.60	**78.91**	2.76	0.0	0.0	-	-
BH-06 30.0m-31.5m	54.0	2290.22	110	695	167	72.92	**73.21**	2.76	0.0	0.0	-	-
BH-06 31.5m-33.0m	54.0	2290.22	109	689	182	79.47	**79.63**	2.76	0.0	0.0	-	-
BH-06 33.0m-34.5m	54.0	2290.22	110	692	179	78.16	**78.47**	2.75	0.0	0.0	-	-
BH-06 34.5m-36.0m	54.0	2290.22	110	693	190	82.96	**83.30**	2.75	0.0	0.0	-	-
BH-06 36.0m-37.5m	54.0	2290.22	109	689	192	83.83	**84.00**	2.76	0.0	0.0	-	-
BH-06 37.5m-39.0m	54.0	2290.22	111	700	185	80.78	**81.27**	2.75	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-06 39.0m-40.5m	54.0	2290.22	111	702	194	84.71	**85.22**	2.76	0.0	0.0	-	-
BH-06 40.5m-42.0m	54.0	2290.22	110	699	176	76.85	**77.16**	2.77	0.0	0.0	-	-
BH-06 42.0m-43.5m	54.0	2290.22	109	695	199	86.89	**87.07**	2.78	0.0	0.0	-	-
BH-06 43.5m-45.0m	54.0	2290.22	106	678	194	84.71	**84.37**	2.79	0.0	0.0	-	-
BH-06 45.0m-46.5m	54.0	2290.22	110	701	204	89.07	**89.43**	2.78	0.0	0.0	-	-
BH-06 46.5m-48.0m	54.0	2290.22	110	702	201	87.76	**88.12**	2.79	0.0	0.0	-	-
BH-06 48.0m-49.5m	54.0	2290.22	110	699	198	86.45	**86.80**	2.77	0.0	0.0	-	-
BH-06 49.5m-51.0m	54.0	2290.22	108	688	212	92.57	**92.57**	2.78	0.0	0.0	-	-
BH-06 51.0m-52.5m	54.0	2290.22	110	702	205	89.51	**89.87**	2.79	0.0	0.0	-	-
BH-06 52.5m-54.0m	54.0	2290.22	110	699	210	91.69	**92.06**	2.77	0.0	0.0	-	-
BH-06 54.0m-55.5m	54.0	2290.22	110	700	219	95.62	**96.01**	2.78	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-06 57.0m-58.5m	54.0	2290.22	110	701	210	91.69	**92.06**	2.78	0.0	0.0	-	-
BH-06 58.5m-60.0m	54.0	2290.22	109	692	205	89.51	**89.69**	2.77	0.0	0.0	71050	0.16
BH-06 60.0m-61.5m	54.0	2290.22	110	700	214	93.44	**93.82**	2.78	0.0	0.0	71233	0.18
BH-06 61.5m-62.0m	54.0	2290.22	110	702	211	92.13	**92.50**	2.79	0.0	0.0	74169	0.16
BH-10 0.0m-1.5m	54.0	2290.22	98	599	65	28.38	**27.81**	2.67	0.1	0.4	-	-
BH-10 1.5m-3.0m	54.0	2290.22	110	685	72	31.44	**31.56**	2.72	0.1	0.3	-	-
BH-10 3.0m-4.5m	54.0	2290.22	110	685	73	31.87	**32.00**	2.72	0.1	0.1	-	-
BH-10 4.5m-6.0m	54.0	2290.22	112	699	92	40.17	**40.49**	2.73	0.0	0.1	-	-
BH-10 6.0m-7.5m	54.0	2290.22	110	687	85	37.11	**37.26**	2.73	0.0	0.1	-	-
BH-10 7.5m-9.0m	54.0	2290.22	109	681	79	34.49	**34.56**	2.73	0.0	0.1	-	-
BH-10 9.0m-10.5m	54.0	2290.22	110	688	86	37.55	**37.70**	2.73	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-10 10.5m-12.0m	54.0	2290.22	109	682	83	36.24	**36.31**	2.73	0.0	0.0	-	-
BH-10 12.0m-13.5m	54.0	2290.22	108	675	74	32.31	**32.31**	2.73	0.0	0.0	-	-
BH-10 13.5m-15.0m	54.0	2290.22	110	688	77	33.62	**33.76**	2.73	0.0	0.0	-	-
BH-10 15.0m-16.5m	54.0	2290.22	110	690	89	38.86	**39.02**	2.74	0.0	0.0	-	-
BH-10 16.5m-18.0m	54.0	2290.22	105	659	95	41.48	**41.23**	2.74	0.0	0.0	-	-
BH-10 18.0m-19.5m	54.0	2290.22	110	689	104	45.41	**45.59**	2.73	0.0	0.0	-	-
BH-10 19.5m-21.0m	54.0	2290.22	110	691	115	50.21	**50.42**	2.74	0.0	0.0	-	-
BH-10 21.0m-22.5m	54.0	2290.22	110	691	121	52.83	**53.05**	2.74	0.0	0.0	-	-
BH-10 22.5m-24.0m	54.0	2290.22	110	692	119	51.96	**52.17**	2.75	0.0	0.0	-	-
BH-10 24.0m-25.5m	54.0	2290.22	112	705	136	59.38	**59.86**	2.75	0.0	0.0	-	-
BH-10 25.5m-27.0m	54.0	2290.22	110	691	151	65.93	**66.20**	2.74	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-10 27.0m-28.5m	54.0	2290.22	110	693	157	68.55	**68.83**	2.75	0.0	0.0	-	-
BH-10 28.5m-30.0m	54.0	2290.22	110	696	149	65.06	**65.32**	2.76	0.0	0.0	-	-
BH-10 30.0m-31.5m	54.0	2290.22	110	699	175	76.41	**76.72**	2.77	0.0	0.0	-	-
BH-10 31.5m-33.0m	54.0	2290.22	107	677	163	71.17	**71.03**	2.76	0.0	0.0	-	-
BH-10 33.0m-34.5m	54.0	2290.22	110	695	174	75.98	**76.28**	2.76	0.0	0.0	-	-
BH-10 34.5m-36.0m	54.0	2290.22	111	702	182	79.47	**79.95**	2.76	0.0	0.0	-	-
BH-10 36.0m-37.5m	54.0	2290.22	110	701	195	85.14	**85.49**	2.78	0.0	0.0	-	-
BH-10 37.5m-39.0m	54.0	2290.22	110	699	216	94.31	**94.69**	2.77	0.0	0.0	66789	0.23
BH-10 39.0m-40.5m	54.0	2290.22	110	698	223	97.37	**97.76**	2.77	0.0	0.0	66234	0.19
BH-10 40.5m-42.0m	54.0	2290.22	110	703	220	96.06	**96.45**	2.79	0.0	0.0	70555	0.2
BH-18 0.0m-1.5m	54.0	2290.22	72	437	16	6.99	**6.48**	2.65	0.3	0.8	-	-

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-18 1.5m-3.0m	54.0	2290.22	111	681	58	25.33	**25.48**	2.68	0.2	0.5	-	-
BH-18 3.0m-4.5m	54.0	2290.22	112	688	62	27.07	**27.29**	2.68	0.0	0.5	-	-
BH-18 4.5m-6.0m	54.0	2290.22	111	690	68	29.69	**29.87**	2.71	0.2	0.4	-	-
BH-18 6.0m-7.5m	54.0	2290.22	110	683	67	29.25	**29.37**	2.71	0.2	0.5	-	-
BH-18 7.5m-9.0m	54.0	2290.22	110	682	78	34.06	**34.19**	2.71	0.2	0.3	-	-
BH-18 9.0m-10.5m	54.0	2290.22	111	692	85	37.11	**37.34**	2.72	0.1	0.2	-	-
BH-18 10.5m-12.0m	54.0	2290.22	110	686	89	38.86	**39.02**	2.72	0.1	0.1	-	-
BH-18 12.0m-13.5m	54.0	2290.22	110	687	91	39.73	**39.89**	2.73	0.0	0.1	-	-
BH-18 13.5m-15.0m	54.0	2290.22	110	687	90	39.30	**39.46**	2.73	0.0	0.0	-	-
BH-18 15.0m-16.5m	54.0	2290.22	111	692	79	34.49	**34.70**	2.72	0.0	0.0	-	-
BH-18 16.5m-18.0m	54.0	2290.22	109	679	85	37.11	**37.19**	2.72	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-18 18.0m-19.5m	54.0	2290.22	110	685	93	40.61	**40.77**	2.72	0.0	0.0	-	-
BH-18 19.5m-21.0m	54.0	2290.22	110	690	106	46.28	**46.47**	2.74	0.0	0.0	-	-
BH-18 21.0m-22.5m	54.0	2290.22	111	690	115	50.21	**50.52**	2.71	0.0	0.0	-	-
BH-18 22.5m-24.0m	54.0	2290.22	110	689	126	55.02	**55.24**	2.73	0.0	0.0	-	-
BH-18 24.0m-25.5m	54.0	2290.22	110	693	119	51.96	**52.17**	2.75	0.0	0.0	-	-
BH-18 25.5m-27.0m	54.0	2290.22	110	692	128	55.89	**56.11**	2.75	0.0	0.0	-	-
BH-18 27.0m-28.5m	54.0	2290.22	109	687	135	58.95	**59.06**	2.75	0.0	0.0	-	-
BH-18 28.5m-30.0m	54.0	2290.22	110	696	142	62.00	**62.25**	2.76	0.0	0.0	-	-
BH-18 30.0m-31.5m	54.0	2290.22	110	701	178	77.72	**78.03**	2.78	0.0	0.0	-	-
BH-18 31.5m-33.0m	54.0	2290.22	110	699	169	73.79	**74.09**	2.77	0.0	0.0	-	-
BH-18 33.0m-34.5m	54.0	2290.22	110	702	180	78.60	**78.91**	2.79	0.0	0.0	-	-

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No, Depth (m)	Dia of sample (D) (mm)	Area of Sample (A) (mm^2)	Length of Sample (L) (mm)	Weight of sample (gm)	Compressive Load (KN)	Compressive Strength (CS) (N/mm^2)	Corrected Compressive strength (N/mm^2)	Density (g/cm^3)	Water Content (%)	Porosity (%)	Modulus of Elastsity "E" "MPa"	Poissons Ratio "μ"
BH-18 34.5m-36.0m	54.0	2290.22	110	700	224	97.81	**98.20**	2.78	0.0	0.0	-	-
BH-18 36.0m-37.5m	54.0	2290.22	109	692	236	103.05	**103.25**	2.77	0.0	0.0	67326	0.19
BH-18 37.5m-39.0m	54.0	2290.22	110	702	235	102.61	**103.02**	2.79	0.0	0.0	68755	0.17
BH-18 39.0m-40.0m	54.0	2290.22	110	702	231	100.86	**101.27**	2.79	0.0	0.0	65249	0.17

PHYSICAL PROPERTIES OF ROCK PIECES (POINT LOAD INDEX) as per IS : IS: 8764, 1124

Borehole No , Depth (m)	Dia (mm)	Thickness (mm)	Length (mm)	Area (mm^2)	Weight (gms)	Failure Load (P) (N)	D_{50}	WD^0.75	SQRT (D50)	Point load Index $I_s(50)\ (N/mm2) = \frac{P}{(WD)^{0.75} * SQRT(50)}$	Estimated UCS 15* I_s (50) (N/mm2)	Density (g/cm^3)	water absorption (%)	Porosity (%)
BH-01 24.0m-25.5m	54	30	-	2289	175	240.00	50	330.935	7.071	0.103	**1.54**	2.55	0.5	1.8
BH-01 25.5m-27.0m	54	42	-	2289	249	270.00	50	330.935	7.071	0.115	**1.73**	2.59	0.3	1.1

CIVIL LAB AND GEOTECH CONSULTANTS

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Appendix B

Laboratory Test Results of Soil/Rock Samples

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Sample reciept	20.03.2025		
		Date of Testing	21.03.2025 to 07.04.2025		

Borehole No , Depth (m)	Dia (mm)	Thickness (mm)	Length (mm)	Area (mm^2)	Weight (gms)	Failure Load (P) (N)	D_{50}	WD^0.75	SQRT (D50)	Point load Index $I_s(50)\ (N/mm2) = \frac{P}{(WD)^{0.75} * SQRT(50)}$	Estimated UCS 15* I_s (50) (N/mm2)	Density (g/cm^3)	water absorption (%)	Porosity (%)
BH-02 24.0m-25.5m	54	31	-	2289	183	300.00	50	330.935	7.071	0.128	**1.92**	2.58	0.4	0.8
BH-02 25.5m-27.0m	54	25	-	2289	144	260.00	50	330.935	7.071	0.111	**1.67**	2.52	0.7	1.7
BH-02 27.0m-28.5m	54	40	-	2289	238	290.00	50	330.935	7.071	0.124	**1.86**	2.60	0.4	0.9
BH-02 28.5m-30.0m	54	30	-	2289	177	300.00	50	330.935	7.071	0.128	**1.92**	2.58	0.5	1.3
BH-12 34.5m-35.0m	54	25	-	2289	155	310.00	50	330.935	7.071	0.132	**1.99**	2.71	0.0	0.0

NOTE :

* Sample extracted from Site location.

This Test Report related to the sample submitted for testing only.

This Test Report shall not be reproduced, except in full, without the approval of the laboratory.

Any correction/whitner invalidates this Tests Report.

Mohammed Habeeb, Quality Manager

Authorised Signatory

APPENDIX-C

Detailed Calculations of Rock Mass Rating (RMR)
IS : 12070-1987

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	20.03.2025		

Rock Mass Rating as per IS : 12070-1987

BH-01			Rock Mass Rating Parameters														
Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
22.5	24.0	1.5	1.5	4	0	3	<60	5	Slickered Surface	10	Wet	7	Un Favourable	-10	19	V	Very Poor
24.0	25.5	1.5	1.54	4	0	3	<60	5	Slickered Surface	10	Wet	7	Un Favourable	-10	19	V	Very Poor
30.0	31.5	1.5	10.94	2	0	3	<60	5	Slickered Surface	10	Wet	7	Un Favourable	-10	17	V	Very Poor
31.5	33.0	1.5	10.96	2	22	3	<60	5	Slightly Rough	20	Wet	7	Un Favourable	-10	27	IV	Poor
33.0	34.5	1.5	15.34	2	24	3	<60	5	Slightly Rough	20	Wet	7	Un Favourable	-10	27	IV	Poor
36.0	37.5	1.5	20.6	2	83	17	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	49	III	Fair
37.5	39.0	1.5	28.44	4	93	17	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	51	III	Fair
39.0	40.5	1.5	31.56	4	96	17	200-600mm	10	Slightly Rough	20	Wet	7	Favourable	-2	56	III	Fair
40.5	42.0	1.5	32.88	4	95	17	200-600mm	10	Slightly Rough	20	Wet	7	Favourable	-2	56	III	Fair
42.0	43.0	1.0	30.25	4	97	17	200-600mm	10	Slightly Rough	20	Wet	7	Favourable	-2	56	III	Fair

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Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	20.03.2025		

BH-02			**Rock Mass Rating Parameters**														
Depth		**Run (m)**	**UCS**		**RQD**		**Spacing of Discontinuties**		**Condition of Discontinuties**		**Ground Water Condition**		**Joint Orientation**		**RMR Classification**		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
24.0	25.5	1.5	1.92	4	0	3	<60	5	Slickered Surface	10	Wet	7	Un Favourable	-10	19	V	Very Poor
25.5	27.0	1.5	1.67	4	0	3	<60	5	Slickered Surface	10	Wet	7	Un Favourable	-10	19	V	Very Poor
27.0	28.5	1.5	1.86	4	16	3	<60	5	Slickered Surface	10	Wet	7	Un Favourable	-10	19	V	Very Poor
28.5	30.0	1.5	1.92	4	0	3	<60	5	Slickered Surface	10	Wet	7	Un Favourable	-10	19	V	Very Poor
30.0	31.5	1.5	14.73	2	29	8	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	40	IV	Poor
31.5	33.0	1.5	25.43	4	21	8	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	42	III	Fair
33.0	34.5	1.5	27.62	4	94	20	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	54	III	Fair
34.5	35.0	0.5	28.5	4	99	20	200-600mm	10	Slightly Rough	20	Wet	7	Favourable	-2	59	III	Fair

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	20.03.2025		

BH-04			**Rock Mass Rating Parameters**														
Depth		**Run (m)**	**UCS**		**RQD**		**Spacing of Discontinuties**		**Condition of Discontinuties**		**Ground Water Condition**		**Joint Orientation**		**RMR Classification**		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
4.5	6.0	1.5	12.28	2	39	8	<60	5	Slightly Rough	20	Damp	10	Un Favourable	-10	35	IV	Poor
6.0	7.5	1.5	17.97	2	81	17	60-200mm	8	Slightly Rough	20	Damp	10	Un Favourable	-10	47	III	Fair
7.5	9.0	1.5	21.04	2	91	20	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	52	III	Fair
12.0	13.5	1.5	36.97	4	85	17	60-200mm	8	Slightly Rough	25	Wet	7	Fair	-5	56	III	Fair
15.0	16.5	1.5	34.63	4	90	20	200-600mm	10	Slightly Rough	25	Wet	7	Favourable	-2	64	II	Good
18.0	19.5	1.5	31.56	4	93	20	200-600mm	10	Slightly Rough	25	Wet	7	Favourable	-2	64	II	Good
21.0	22.5	1.5	39.89	4	95	20	200-600mm	10	Slightly Rough	25	Wet	7	Favourable	-2	64	II	Good
25.5	27.0	1.5	52.17	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
28.5	30.0	1.5	54.36	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
30.0	31.5	1.5	63.57	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
31.5	33.0	1.5	67.07	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good

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Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	20.03.2025		

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
33.0	34.5	1.5	65.76	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
34.5	36.0	1.5	65.32	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
37.5	39.0	1.5	78.03	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
39.0	40.5	1.5	70.58	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
40.5	42.0	1.5	92.06	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
42.0	43.0	1.0	89.43	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	20.03.2025		

BH-06			**Rock Mass Rating Parameters**														
Depth		**Run (m)**	**UCS**		**RQD**		**Spacing of Discontinuties**		**Condition of Discontinuties**		**Ground Water Condition**		**Joint Orientation**		**RMR Classification**		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
3.0	4.5	1.5	25.43	4	83	17	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	51	III	Fair
4.5	6.0	1.5	28.06	4	65	13	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	47	III	Fair
6.0	7.5	1.5	25.87	4	67	13	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	47	III	Fair
10.5	12.0	1.5	34.19	4	33	8	<60	5	Slightly Rough	20	Wet	7	Un Favourable	-10	34	IV	Poor
13.5	15.0	1.5	41.65	4	41	8	<60	5	Slightly Rough	20	Wet	7	Un Favourable	-10	34	IV	Poor
15.0	16.5	1.5	44.72	4	73	13	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	47	III	Fair
16.5	18.0	1.5	46.03	4	73	13	60-200mm	8	Slightly Rough	20	Wet	7	Fair	-5	47	III	Fair
19.5	21.0	1.5	53.92	7	87	17	200-600mm	10	Slightly Rough	25	Wet	7	Fair	-5	61	II	Good
22.5	24.0	1.5	63.26	7	97	20	200-600mm	10	Slightly Rough	25	Wet	7	Favourable	-2	67	II	Good
27.0	28.5	1.5	78.03	7	96	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
30.0	31.5	1.5	73.21	7	97	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good

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Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
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Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	20.03.2025		

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
31.5	33.0	1.5	79.63	7	98	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
36.0	37.5	1.5	84	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
39.0	40.5	1.5	85.22	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
42.0	43.5	1.5	87.07	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
45.0	46.5	1.5	89.43	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
48.0	49.5	1.5	86.8	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
51.0	52.5	1.5	89.87	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
54.0	55.5	1.5	96.01	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
55.5	57.0	1.5	91.19	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
58.5	60.0	1.5	89.69	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
60.0	61.5	1.5	93.82	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
61.5	62.0	0.5	92.5	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good

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Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	20.03.2025		

BH-10

Rock Mass Rating Parameters

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
0.0	1.5	1.5	27.81	4	22	3	60-200mm	8	Slightly Rough	20	Damp	10	Fair	-5	40	IV	Poor
1.5	3.0	1.5	31.56	4	69	13	60-200mm	8	Slightly Rough	20	Damp	10	Fair	-5	50	III	Fair
3.0	4.5	1.5	32	4	63	13	60-200mm	8	Slightly Rough	20	Damp	10	Fair	-5	50	III	Fair
4.5	6.0	1.5	40.17	4	79	17	200-600mm	10	Slightly Rough	20	Damp	10	Fair	-5	56	III	Fair
10.5	12.0	1.5	36.31	4	85	17	200-600mm	10	Slightly Rough	20	Damp	10	Fair	-5	56	III	Fair
13.5	15.0	1.5	33.76	4	73	13	200-600mm	10	Slightly Rough	20	Damp	10	Fair	-5	52	III	Fair
15.0	16.5	1.5	39.02	4	71	13	200-600mm	10	Slightly Rough	20	Damp	10	Fair	-5	52	III	Fair
16.5	18.0	1.5	41.23	4	53	13	<60	5	Slightly Rough	20	Damp	10	Fair	-5	47	III	Fair
19.5	21.0	1.5	50.42	7	61	13	<60	5	Slightly Rough	20	Damp	10	Fair	-5	50	III	Fair
21.0	22.5	1.5	53.05	7	61	13	<60	5	Slightly Rough	20	Damp	10	Fair	-5	50	III	Fair
24.0	25.5	1.5	59.86	7	62	13	60-200mm	8	Slightly Rough	20	Damp	10	Favourable	-2	56	III	Fair

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Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	20.03.2025		

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
27.0	28.5	1.5	68.83	7	99	20	0.6-2.0m	15	Slightly Rough	25	Damp	10	Favourable	-2	75	II	Good
28.5	30.0	1.5	65.32	7	97	20	0.6-2.0m	15	Slightly Rough	25	Damp	10	Favourable	-2	75	II	Good
30.0	31.5	1.5	76.72	7	99	20	0.6-2.0m	15	Slightly Rough	25	Damp	10	Favourable	-2	75	II	Good
33.0	34.5	1.5	76.28	7	83	17	0.6-2.0m	15	Slightly Rough	25	Damp	10	Favourable	-2	72	II	Good
36.0	37.5	1.5	85.49	7	99	20	0.6-2.0m	15	Slightly Rough	25	Damp	10	Favourable	-2	75	II	Good
37.5	39.0	1.5	94.69	7	100	20	0.6-2.0m	15	Slightly Rough	25	Damp	10	Favourable	-2	75	II	Good
39.0	40.5	1.5	97.76	7	100	20	0.6-2.0m	15	Slightly Rough	25	Damp	10	Favourable	-2	75	II	Good
40.5	42.0	1.5	96.06	7	100	20	0.6-2.0m	15	Slightly Rough	25	Damp	10	Favourable	-2	75	II	Good

BH-12			Rock Mass Rating Parameters														
Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
34.5	35.0	0.5	1.99	4	0	3	<60	5	Slightly Rough	20	Wet	7	Un Favourable	-10	29	IV	Poor

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An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

Project Name:	Geotechnical Investigation for Consultancy Services for Preparation of DPR for the Work of Construction of Under Ground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction			Report No.	CLGC/24G0291
Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	20.03.2025		

BH-18			**Rock Mass Rating Parameters**														
Depth		**Run (m)**	**UCS**		**RQD**		**Spacing of Discontinuties**		**Condition of Discontinuties**		**Ground Water Condition**		**Joint Orientation**		**RMR Classification**		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
0.0	1.5	1.5	6.48	2	0	3	<60	5	Slightly Rough	20	Damp	10	Un Favourable	-10	30	IV	Poor
1.5	3.0	1.5	25.48	4	71	13	60-200mm	8	Slightly Rough	20	Damp	10	Fair	-5	50	III	Fair
3.0	4.5	1.5	27.29	4	65	13	60-200mm	8	Slightly Rough	20	Damp	10	Fair	-5	50	III	Fair
6.0	7.5	1.5	29.37	4	77	17	200-600mm	10	Slightly Rough	20	Wet	7	Fair	-5	53	III	Fair
9.0	10.5	1.5	37.34	4	99	20	200-600mm	10	Slightly Rough	20	Wet	7	Favourable	-2	59	III	Fair
12.0	13.5	1.5	39.89	4	91	20	200-600mm	10	Slightly Rough	20	Wet	7	Favourable	-2	59	III	Fair
13.5	15.0	1.5	39.46	4	91	20	200-600mm	10	Slightly Rough	20	Wet	7	Favourable	-2	59	III	Fair
16.5	18.0	1.5	37.19	4	95	20	200-600mm	10	Slightly Rough	25	Wet	7	Favourable	-2	64	II	Good
19.5	21.0	1.5	46.47	4	98	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	69	II	Good
21.0	22.5	1.5	50.52	7	91	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
22.5	24.0	1.5	55.24	7	99	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good

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Address:	Hebbal Esteem Mall Junction to Silk Board KSRP Junction	Location/ ID Mark	Bengaluru	Date	07.04.2025
Customer	M/s. Rodic Consultants Pvt Ltd	Date of Sample Reciept	20.03.2025		

Depth		Run (m)	UCS		RQD		Spacing of Discontinuties		Condition of Discontinuties		Ground Water Condition		Joint Orientation		RMR Classification		
From	to		Mpa	Rating	%	Rating	Condition	Rating	Condition	Rating	Condition	Rating	Condition	Rating	RMR	Class of Rock	Classification
24.0	25.5	1.5	52.17	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
27.0	28.5	1.5	59.06	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
28.5	30.0	1.5	62.25	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
30.0	31.5	1.5	78.03	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
33.0	34.5	1.5	78.91	7	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	72	II	Good
36.0	37.5	1.5	103.25	12	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	77	II	Good
37.5	39.0	1.5	103.02	12	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	77	II	Good
39.0	40.0	1.0	101.27	12	100	20	0.6-2.0m	15	Slightly Rough	25	Wet	7	Favourable	-2	77	II	Good

NOTE :

* Sample extracted from Site location.

This Test Report related to the sample submitted for testing only.

This Test Report shall not be reproduced, except in full, without the approval of the laboratory.

Any correction/whitner invalidates this Tests Report.

Mohammed Habeeb, Quality Manager

Authorised Signatory

FIG-1

PHOTOS OF GEOTECHNICAL INVESTIGATION FOR CONSULTANCY SERVICES FOR PREPARATION OF DPR FOR THE WORK OF CONSTRUCTION OF UNDER GROUND VEHICULAR TUNNEL FROM HEBBAL ESTEEM MALL JUNCTION TO SILK BOARD KSRP JUNCTION

BH-01, Bethel Church, Hebbal, Bengaluru.

BH-02, Opp Bethel Church, Hebbal, Bengaluru.

BH-04, Race Course, Bengaluru.

BH-06, Bengaluru City University, Bengaluru.

BH-07, Banappa Park, Bengaluru.

BH-10, Lal Bagh, Bengaluru.

BH-12, Opp Bethel Church, Hebbal, Bengaluru.

BH-18, Atria University, Bengaluru.

BH-01
Lab Reference No: 24G0291
Client Name: Ms. Rodic Consultants
Project: Consultancy Services for Preparation of DPR for the Work of construction of Underground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction.
Location: Bethel Church, Bangalore

BH-01, Bethel Church, Hebbal, Bengaluru.

BH-02
Lab Reference No: 24G0291
Client Name: Ms. Rodic Consultants
Project: Consultancy Services for Preparation of DPR for the Work of construction of Underground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction.
Location: Opposite to Bethel Church, Hebbal, Bangalore

BH-02, Opp Bethel Church, Hebbal, Bengaluru.

BH-04, Race Course, Bengaluru.

BH-06, Bengaluru City University, Bengaluru.

BH-07, Banappa Park, Bengaluru.

BH-10, Lal Bagh, Bengaluru.

BH-12
Lab Reference No: 24G0291
Client Name: Ms. Rodic Consultants
Project: Consultancy Services for Preparation of DPR for the Work of construction of Underground Vehicular Tunnel from Hebbal Esteem Mall Junction to Silk Board KSRP Junction.
Location: Opposite to Bethel Church, Hebbal, Bangalore

BH-12, Opp Bethel Church, Hebbal, Bengaluru.

BH-18, Atria University, Bengaluru.

APPENDIX-D

SOIL/ROCK PROFILE

CIVIL LAB AND GEOTECH CONSULTANTS

An Independent NABL-ISO/IEC: 17025 Accredited Laboratory for Geotechnical Investigation & Building Material/Soil/Rock/NDT Testing Services

APPENDIX-D

PROFILE OF SOIL AND ROCK STRATUM WITH RESPECT TO EXISTING GROUND LEVEL

Depth (m)	BH-01 N values	BH-02 N values	BH-04 N values	BH-06 N values	BH-07 N values
0.00					
1.50	-	6	14	R	13
3.00	-	8	16	R	20
4.50	10	18	R	-	26
6.00	13	25	-	-	30
7.50	16	20	-	-	32
9.00	18	29	-	-	43
10.50	23	33	-	-	73
12.00	23	41	-	-	R
13.50	66	43	-	-	R
15.00	R	R	-	-	R
16.50	R	R	-	-	R
18.00	R	R	-	-	R
19.50	R	R	-	-	R
21.00	R	R	-	-	R
22.50	R	R	-	-	R
24.00	-	R	-	-	R
25.50	-	-	-	-	
27.00	-	-	-	-	
28.50	-	-	-	-	
30.00	-	-	-	-	
31.50	-	-	-	-	
33.00	-	-	-	-	
34.50	-	-	-	-	
36.00	-		-	-	
37.50	-		-	-	
39.00	-		-	-	
40.50	-		-	-	
42.00	-		-	-	
43.50	-		-	-	
45.00				-	
46.50				-	
48.00				-	
49.50				-	
51.00				-	
52.50				-	
54.00				-	
55.50				-	
57.00				-	
58.50				-	
60.00				-	
61.50				-	
62.00				-	

Legend: **Granular Soil** | **Soft Rock** | **Weathered Rock**

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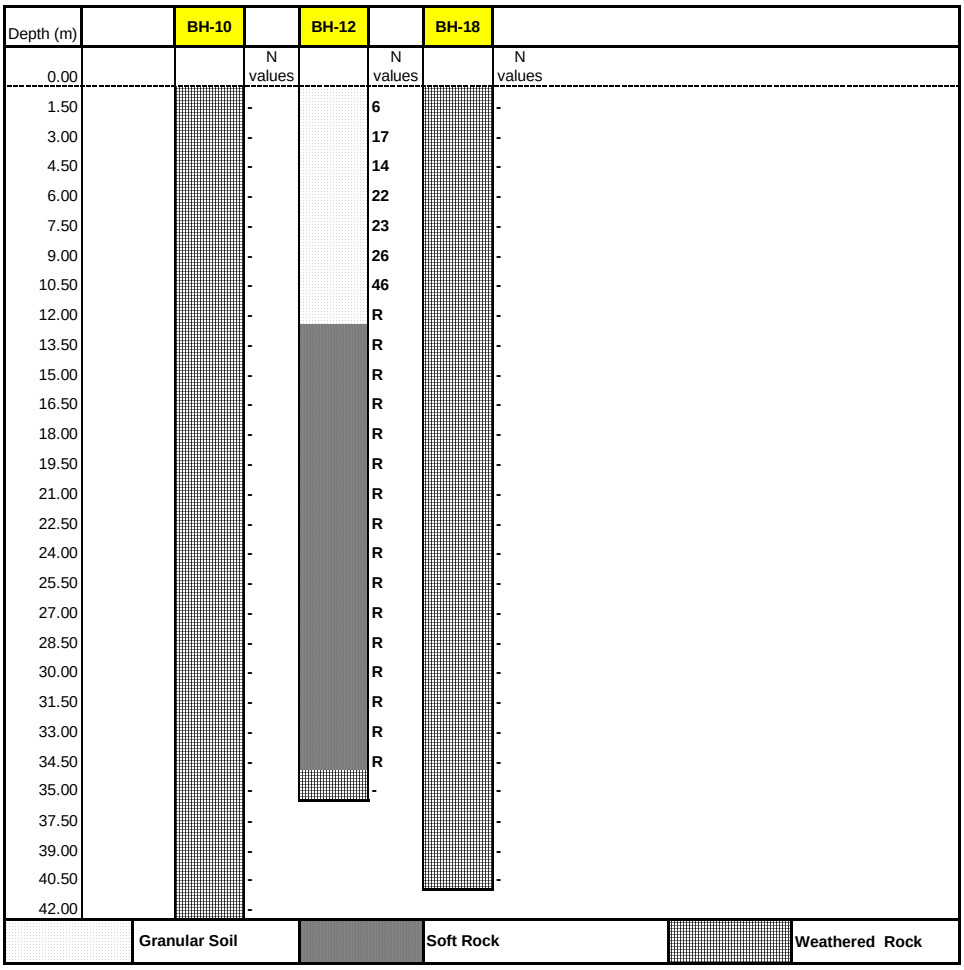
APPENDIX-D

PROFILE OF SOIL AND ROCK STRATUM WITH RESPECT TO EXISTING GROUND LEVEL